NEW ZEALAND JOURNAL OF

Agriculture

JUNE - 1951

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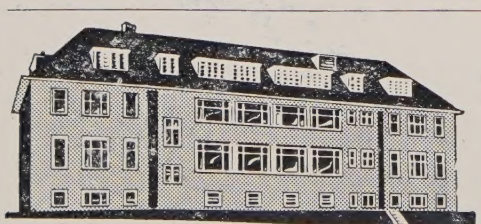

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NEW ZEALAND JOURNAL OF Agriculture

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Hon. K. J. Holyoake,
Minister of Agriculture.

This Month's Cover

Correct pruning has an important influence on the production and vigour of fruit trees and on the efficiency of spraying to control pests and diseases. It is one of the main winter tasks of growers of pip and stone fruits and more time is spent on it than on any other single winter operation. This month's cover, which has been reproduced from a colour photograph by Sparrow Industrial Pictures Ltd., shows pruning of a mature tree in an Auckland orchard.

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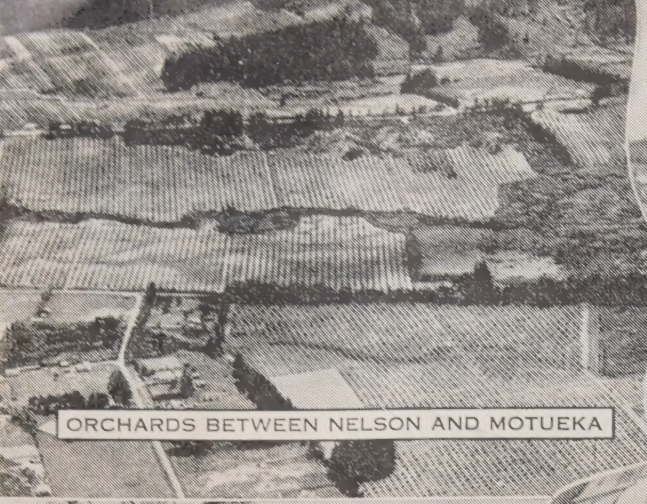
PIP AND STONE FRUIT PRODUCTION



ORCHARDS BETWEEN NELSON AND MOTUEKA

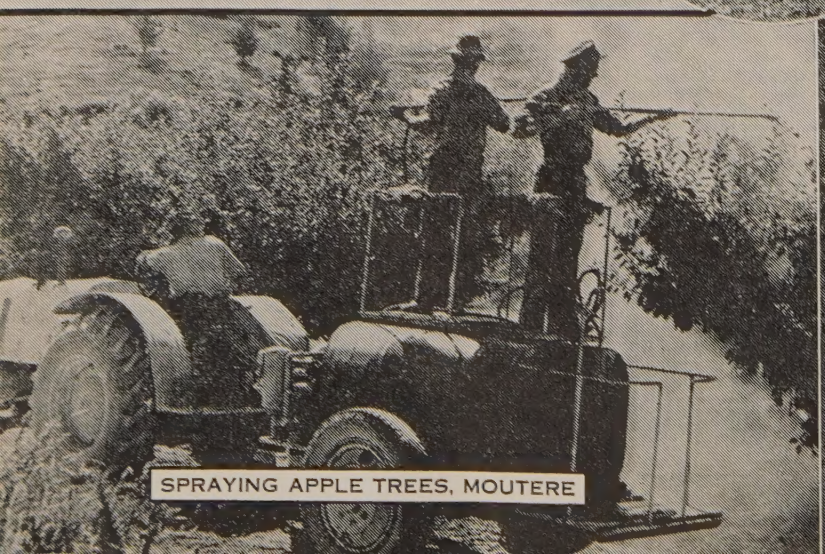
ROTARY HOE CULTIVATION

DISC CULTIVATING

APPLE ORCHARD, MAPUA

To some extent climate governs the kinds of fruit grown in various parts of New Zealand, but apples, pears, peaches, and plums are grown almost everywhere. The main apple- and pear-growing areas are in Nelson, Hawkes Bay, and Central Otago, and near Auckland. The average economic orchard unit is about 12 acres.

[Photographs by "Weekly News", V. C. Browne, National Publicity Studios, and Sparrow Industrial Pictures Ltd.



SPRAYING APPLE TREES, MOUTERE

HARVESTING PEARS, HAWKES BAY

Added Incentive to Counties to Control Weeds

TO a country like New Zealand, whose national economy is founded on grassland farming, the prevention of the spread of weeds in its pastures and other crops is of paramount importance. The approach to this problem of weed control in the Dominion has unfortunately not been sufficiently realistic in the past and landholders today are suffering in varying measure from the results of apathy of earlier generations. Some species of weeds which have been introduced to this country either deliberately or fortuitously have spread so quickly and so extensively that not only have they reduced the productivity of the fertile land they have invaded, but they have created difficulties which have been costly and slow to overcome.

With the object of achieving greater control of noxious weeds the Government introduced legislation to the last session of Parliament revising the Noxious Weeds Act, 1928, and incorporating recommendations made by a committee of representatives of certain organisations and Departmental officers set up to consider the measures necessary to secure weed eradication. The Noxious Weeds Act, 1950, aims at encouraging local bodies to assume responsibility for the administration of the Act within their districts and provides for financial assistance by way of a Government subsidy toward the cost of administration. This Act became operative on April 1, 1951, and already nearly half of the county councils in the Dominion are now administering its provisions within the counties they represent. To help these local bodies meet the cost of administration the Government has decided to grant them a £1 for £1 subsidy.

Though county councils have had the power to administer the 1928 Act in their districts since 1934, less than half the Dominion total had exercised this right before the passing of the 1950 Act. I hope that this subsidy will provide an added incentive to those rural local bodies who to date have not taken over the administration of the Act, as the Government recognises that effective control of noxious weeds can be achieved only by having the administration vested in the local body of a district.

Development of Chemical Weedkillers

During the war, when labour and material shortages became acute, the work of prevention of weed invasion and destruction of weeds had necessarily to be largely forsaken to meet the more urgent demands for war production. Since then and as a result of the increased labour demands of the post-war period the encroachment of weeds on our farmlands has increased.

In recent years hope of efficient and relatively easy destruction of weeds has been stimulated by the great strides made in the development of chemical weedkillers and in particular hormone preparations. However, though the potentialities of these new weedkillers are apparently considerable, much investigational work has yet to be done. Extensive experimental work has been undertaken on chemical weedkillers by private and official organisations.

Officers of the Departments of Agriculture and Scientific and Industrial Research have laid down approximately 600 field trials in all districts of New Zealand since the war and have carried out tests on most weeds of agricultural importance. A series of yield trials has been undertaken on cereals, linseed, and potatoes in Canterbury, where experiments have also been made with crop-spraying equipment for weedkilling.

The results of some of these trials have already been published in the "Journal of Agriculture", and information about the findings of other experiments will be printed as it becomes available. This will ensure farmers' keeping abreast of the latest scientific developments and will furnish guidance to them on the efficacy of chemical weedkilling preparations.

Unremitting War on Weeds Essential

Whatever success is attained in evolving efficient weedkillers and machinery for applying those weedkillers, the need for unremitting war on weeds will continue. Weeds allowed to develop and mature not only reduce the productive capacity of the land on which they grow, but endanger other land which is weed free. The establishment of plants like water hyacinth, nassella tussock, blackberry, and gorse which has already occurred illustrates plainly the menace that noxious weeds can become to our agricultural industry if they remain unchecked.

The raising of the levels of our future production may well depend on more intensive farming and greater stock-carrying capacity. It is certain at least that increased production must be our aim, and to reach this an essential pre-requisite is the cleaning of our grass and arable land of weeds. The present economic effect of noxious weeds on primary production is marked, but their potential effect can be disastrous. Effective weed control will be accomplished only by wholehearted co-operation between the farmers, local bodies, and Government agencies, and I feel sure that the new legislation and the assistance it offers will go far toward reaching this end.

K. J. HOLYOAKE, Minister of Agriculture.

The Home Garden in July

By H. P. THOMAS, Vegetable Instructor,
Department of Agriculture, Wanganui

CAUTION should be exercised with sowing and planting in July. Except in very warm localities with good soil conditions, there is little to be gained by sowing seeds or putting out plants until August. However, frames and cloches in warm positions could now be used for seed sowing and the production of plants of lettuce, cabbage, cauliflower, and silver beet for August and September plantings.

WHERE climatic conditions are not too severe spring cabbage, cauliflower, lettuce, and shallots can be planted out in well-worked and well-drained soil in July.

Seed potatoes of the early crop should be set in trays with broader or "rose" ends up and they should be stored in a light, airy, frost-free shed. Jerusalem artichoke tubers can be sorted and those suitable for seed put aside for planting as soon as the soil is in workable condition.

If new rhubarb and asparagus beds have not yet been prepared, the work should be done now and planting carried out as opportunity arises. Cultivation of vacant areas or the digging in of green crops should be done whenever the state of the ground permits in preparation for spring sowing and planting. Any alterations or additions necessary to garden layout, shelter, or drainage should be finished without delay.

Preparation may be made for hotbeds by gathering long, strawy stable manure and dead leaves. Stored crops should be examined and any vegetables showing signs of decay should be removed.

General Maintenance

Digging or trenching vacant ground and turning in green crops should be continued whenever the ground is in suitable condition. Woody garden material considered unsuitable for composting should be burnt and the ash stored in a dry place until required; wood ash exposed to rain soon loses its lime and potash content.

If drainage and shelter have not been provided, it will be necessary to carry out this work as weather permits during July; otherwise a delay of a season will result. Weed growth should be cleared from neglected corners and beneath hedges, as it not only harbours pests of many kinds, but may act as host plants for fungous and virus diseases. This work also improves the appearance of the garden.

Sowing and Planting

The end of the month is early enough, even in favourably situated districts, for sowing and planting, and in most gardens this work is not begun in earnest until August or even later. Seed sowing is not determined by the calendar. The type and state of the ground as well as climatic conditions must also be considered.

Light or medium soils dry out more quickly and afford more opportunities for early sowing than heavy soils. Where the soil is heavy a specially constructed seed-bed made of soil containing a high percentage of sand is an advantage if seed boxes are not available. A movable frame placed over this outdoor seed-bed will increase its utility.

Where climatic and soil conditions are favourable sowings should preferably be small and limited to the comparatively hardy subjects such as broad beans, spinach, silver beet, spinach beet, spring onions, carrots, turnip, beetroot, and radish.

In less-favoured districts lettuce, summer cabbage, cauliflower, and silver beet can be sown in frames or under cloches. Where cloches are used, however, it is advisable to place them in position on well-drained soil 10 to 14 days before sowing to enable the soil to warm and to some extent dry out.

Hardy subjects such as spring cabbage and shallots can be planted out in manured and well-drained soil, and where climatic conditions are favourable lettuce and cauliflower plants can also be set out. Where soil conditions permit, new plantings of asparagus may be made toward the end of the month if sufficient preparation has been given to the bed. Rhubarb crowns which have recently been divided and put aside to develop buds may be replanted in July. As both plantings are semi-permanent, the preparation of the beds should be thorough. They should be deeply dug and organic manure such as farmyard or stable manure, and blood and bone dug in. Deep digging is desirable, particularly on heavy soils, as it improves drainage, which is important in successful production. Established rhubarb and asparagus beds should be lightly cultivated and mulched with compost or a light dressing of farmyard manure and soil if this has not already been done.

Celery and leek plants should receive their final earthing up and if growth is backward, liquid manure should be applied.

REMINDERS FOR JULY

Sow: Broad beans, beetroot, *cabbage (spring and summer), *cauliflower, carrot, *lettuce, radish, spring onions, spinach, spinach beet, silver beet, turnip, *peas, and tomatoes (under glass for early crops).

* Unless frames or cloches are used, sow only where outdoor conditions are very favourable.

Plant: *Asparagus, cabbage (spring), *cauliflower (spring), herbs, *lettuce, onions, rhubarb, shallots, and *potatoes (a few early rows).

* Plant only in favourable situations where drainage and soil conditions are good.

Crops such as savoy cabbage, broccoli, borecole, leeks, and celery should be kept cultivated and free of weeds. Brussels sprouts, which are naturally tall, may need supporting if growing in an exposed position. This may be done either by individual staking and tying or by supporting with light wire or heavy string attached to stakes on each side of the row. In cooler districts broccoli plants other than those of the self-protecting kind should have some of the leaves broken or tied over the curds as they mature to protect them from hard frosts.

Asparagus

Asparagus roots may be planted toward the end of July in the North Island where the ground is in good condition and reasonably dry. Planting in August or even September is soon enough for home gardeners in the South Island. An open position should be selected for the bed and efficient drainage is very necessary for its well-being. Where the soil is sufficiently deep and drainage is good flat beds are satisfactory, but raised beds allow deepening of the soil and drainage is materially assisted.

After preparation of the bed as advised in last month's "Journal", strong 1-year-old plants should be selected for planting.

Application before and after planting of a mixture of equal parts of blood and bone and superphosphate plus 1/20 part of sulphate of potash at the rate of 8oz. per square yard will benefit plantings.

Allow at least 2ft. between rows and from 18in. to 2ft. between the plants, as once a bed is properly established it is likely to remain in production for 15 to 20 years. Make drills 4 to 6in. deep and wide enough to accommodate the roots when spread out to full length.

Drills should be made with a crown in the centre and sloping sides, and on these mounds the young roots set saddlewise. A covering of fine sandy soil should then be applied, taking care that this initial covering is not more than 2in. above the top buds of the young plants.

No spears should be taken the first year from a planting of yearling roots, and unless the plants are very vigorous, cutting should be done very sparingly the second season. In the third season, when plants are 4 years old and well established, the bed should stand fairly heavy cutting for up to 8 weeks, after which the remaining growth should be left to mature.

Popular varieties are: Mary Washington, Martha Washington, Connovers Colossal, and Paradise.

Broad Beans

There are few hardier vegetables than broad beans, which if sown early, mature at a time when most vegetables are scarce and lacking in variety. If a successional supply is required or if seed has not yet been sown, a sowing may now be made. Cultural directions were given in the home garden notes in the April issue of the "Journal".

Spring Cabbage

Those home gardeners who prefer to grow their own cabbage plants can now sow seed of a quick-maturing variety such as Golden Acre, Flower of Spring, or Enfield Market. Mid-July is suitable for sowing these kinds in the North Island, but in the South Island they should be sown a little earlier. Golden Acre is a desirable summer variety with a round, compact head of moderate size. Flower of Spring and Enfield Market are two well-known spring varieties with pointed hearts.

A warm, sheltered situation with favourable soil conditions is necessary and where these conditions are lacking it is advisable to use a cold frame or well-ventilated glasshouse.

Seed should be sown in boxes, and unless it is intended to transplant the young seedlings before setting them out in the garden, the boxes must not be less than 6in. deep. Use an open-textured soil with a high humus content and cover seed with ¼in. of fine soil. The seed should be sown thinly or better still spaced 2 to 3in. apart to avoid overcrowding, as the desired type of seedling for transplanting is one with well-developed roots and strong stocky stem and leaf growth. When the plants are about 4in. high they should be placed outside to harden off before being transplanted in the garden.

In southern districts where winters are rather severe some growers set out plants of the Flower of Spring or pointed type of cabbage during July if soil conditions are suitable. If sturdy plants are set out, the crop often reaches maturity little later than those planted earlier. A well-drained soil is essential and if farmyard manure or compost is not available, the following mixture should be worked into the topsoil before planting: 2 parts of blood and bone, 1 part of superphosphate, and ½ part of sulphate or muriate of potash at 4oz. to the square yard.

A dressing of 8oz. of carbonate of lime to the square yard would benefit soils likely to be acid.

Established Crops

Whenever soil conditions allow cultivation should be continued to provide a surface mulch for crops which were planted in autumn and early winter; if plants do not appear to be making strong growth, applications of liquid manure will assist them. When animal manure is not available sulphate of ammonia or nitrate of soda at 1oz. to 4 gallons of water may be used for making liquid manure.

Cauliflowers

Seed of cauliflower should still be sown in boxes. Plants of earlier-sown varieties may be set out where shelter, drainage, and weather conditions are favourable; where they are not it would be wise to delay planting. Most of the recommendations for growing cabbages apply in greater degree to cauliflowers, because the latter are

[Green and Hahn Photography Ltd. photo.

If earlier plantings of spring cabbage do not appear to be making strong growth, they should be given regular applications of liquid animal manure. Where organic manure is not available sulphate of ammonia or nitrate of soda at the rate of 1oz. to 4 gallons of water may be substituted.

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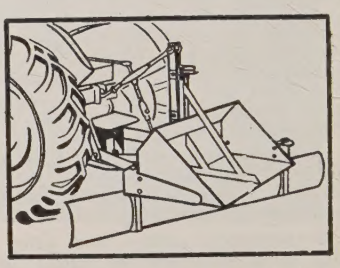

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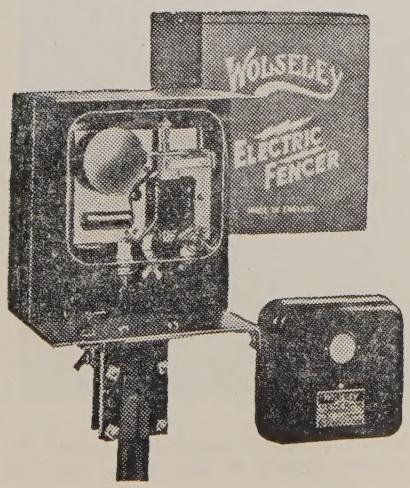

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more delicate plants, and checks during growth due to dryness, severe frost, cold, or injury to the roots during transplanting are likely to result in failures.

Varieties: Early varieties are Early London, Phenomenal Early, Walcheren, and All Seasons.

Herbs

July is a good time to plan the establishment or extension of the herb garden. A narrow border at the foot of a fence and beside a path where access is easy in all weather should provide sufficient space in the average garden. The soil should be deeply trenched and well manured, as many herbs in general use are likely to occupy the bed for several years. Sage, thyme, mint, parsley, and chives are most in demand, and seed or vegetative parts are obtainable from most good seedsmen.

Lettuce

Lettuce seed should still be sown in boxes or frames, as it is yet too early for sowing it in the open. Cultural directions were given in last month's "Journal". Varieties such as Imperial 615, Neapolitan Winter Market, and All the Year Round are suitable for cool weather conditions.

Potatoes

Continue to set potatoes of suitable size to sprout and green as described in last month's "Journal". Small plantings for an early crop could be made in July, particularly in northern districts where a warm, sheltered border can be used. In addition the home gardener should be prepared to keep all top growth earthed up until danger of frost is past.

Carrots, Turnips, Beetroot, Radish

As soon as soil and weather conditions are favourable small sowings of carrots, turnips, beetroot, and radish can be made.

If conditions are not suitable, it is well to delay sowing, as it will be found that sowings made a little later when conditions have improved will usually mature at least as quickly and with less loss. A light, easily worked soil is preferable for early sowings. The ground should be well drained and rich in farmyard manure or organic matter, but not recently dressed, as this induces forking of the roots of these crops. For small sowings drainage can be improved and soil temperatures raised by making raised beds or sowing on ridges.

Seed can be sown ¼ to ½in. deep according to whether the soil is heavy, moist, and cold or light, dry, and warm. Rows are usually 12in. apart, though 8in. would be enough for radish. If seed is sown thinly in well-worked, free soil, radish need not be thinned and carrots can be left until the thinnings are large enough to be used in soups and stews. Beetroot and turnips are best thinned to about 4in. apart for these sowings.

Varieties

Radish: Red and White Turnip and French Breakfast.

Carrot: Early Horn, Early Krop, and Chantenay.

Beetroot: Egyptian Turnip Rooted and Early Wonder.

Turnip: White Stone and Early White Milan.

Sage (shown above) together with thyme, mint, chives, and parsley are the most popular herbs. Beds for herbs should be deeply dug and well manured and should be easy of access in all weathers.

Peas

Where weather conditions are favourable an early sowing of peas may be made in well-drained, preferably medium to light soil. Peas repay good cultural methods. The ground should be deeply dug and enriched with organic matter. Losses in early sowing can be attributed to complete rotting of seed or to attacks by soil-borne diseases which are favoured by the inability of the seed or young plant to make quick growth in soil which has not warmed up enough at this time of year. Peas for early sowing should be lightly coated with one of the mercury dusts, which are procurable from most seedsmen.

Where better drainage is considered necessary, seed may be sown on flat-topped ridges about 6in. high, but it may be sown in the usual way where soil conditions are suitable.

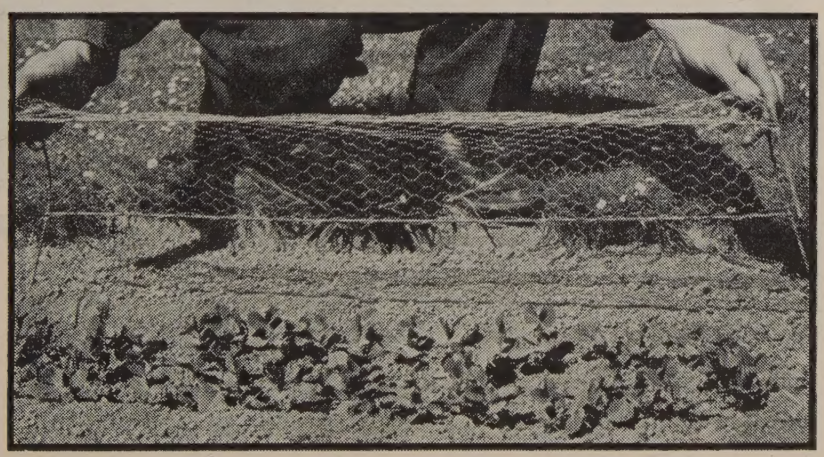
Whether seed is sown on ridge or flat, a shallow trench should be hoed 1 to 2in. deep, according to the type of soil. The seed can be sown in zig-zag fashion 2 to 3in. apart in rows spaced 20in. apart for the early dwarf varieties. One pound of seed should be sufficient for 100ft. of row.

If necessary a dressing of bonedust or superphosphate at 4oz. per 9ft. of row may be worked into the soil where peas are to be planted. Strands of black cotton stretched over the rows about 2in. above the ground will keep birds from damaging the young seedlings. An excellent though more costly method is to cover the rows with strips of fine-mesh wire netting bent into arches and pegged down with wire hooks. These coverings have the added advantage of being available for use for many years.

Varieties for early sowing are: William Massey, Earlicrop, Blue Bantam, and Kelvedon Wonder.

Rhubarb

Established rhubarb should be cleared of weeds and given a liberal



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Adjusting wire netting frame over peas to keep birds off. Coverings of this type have the advantage that they are available for use for many years.

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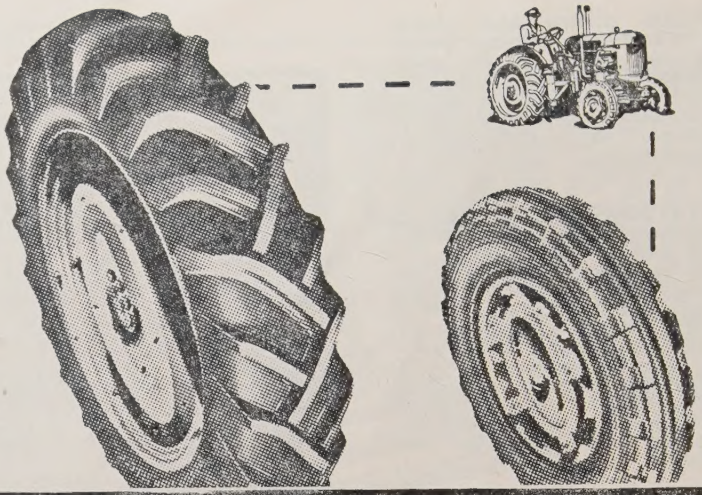

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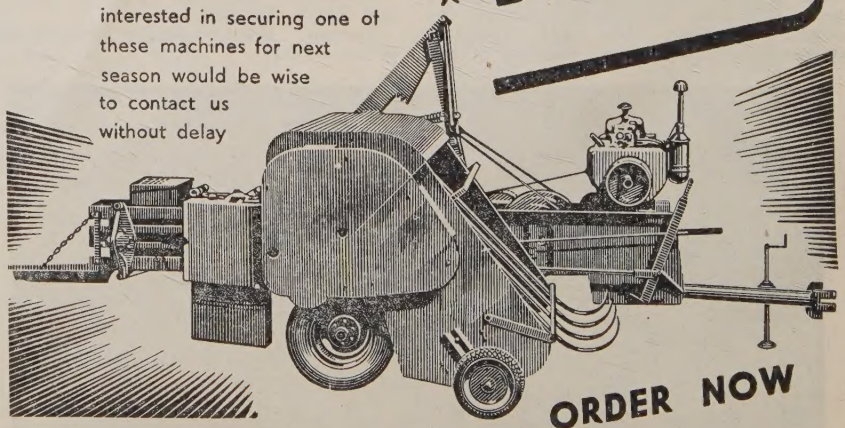

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surface dressing of farmyard manure or well-composted organic matter.

If crowns have been lifted and laid aside to await the development of "buds" before being divided and replanted, they should be examined from time to time so that when they are ready they can be divided and replanted without delay. Information on the preparation and planting of a new bed was given in last month's "Journal". Rhubarb may be easily forced in any situation where there is moderate warmth. Usually an early variety is chosen and the plants are forced by being covered with an overturned box or barrel so that frost and, to some extent, extreme cold are excluded. The covering should be removed on warm, sunny days.

Onions

Onion plants from autumn-sown seed should now be well advanced in readiness for transplanting in August. They should be kept weed free to encourage strong, sturdy growth. The ground for the onion bed should have been thoroughly cultivated and preferably have been manured in autumn with well-rotted farmyard manure or compost. The onion requires a firm bed and for this reason cultivation should have been early to allow for consolidation of the soil before planting. Heavy soils require less consolidation than light soils owing to their tendency to set more firmly than is desirable after heavy rain. If long-keeping bulbs are desired, it is necessary to use slow-acting fertilisers. Broadcast the following fertiliser dressing 2 to 4 weeks before planting and work it in to a depth of 6in.: Bonedust 3 to 4oz. per square yard, superphosphate 2oz. per square yard, and potash 1oz. per square yard. A heavy dressing of wood ash is a good substitute for the potash. A dusting of lime and soot will also be beneficial.

Spring Onions

A small sowing of spring onions may be made now in a sheltered part of the garden. If drainage seems to be unsatisfactory, a raised bed should be made. Seed can be broadcast and lightly covered with soil or it can be sown fairly thickly in rows 12in. apart. The soil should be firmed over the seed with the back of a spade.

[*Green and Hahn Photography Ltd. photo.*

Leeks are essentially a winter crop, and providing liberal amounts of farmyard manure or compost have been used, excellent crops are obtained with a minimum of attention.

Silver Beet, Spinach Beet, Spinach

Silver beet and the closely allied spinach beet are two very suitable hardy vegetables for early sowing.

The soil should be well drained and cultivated and enriched with well-rotted organic material. The area to be used for the crop will benefit by the application of a manure mixture consisting of 3 parts of superphosphate and 1 part of sulphate of ammonia (by weight) applied at the rate of 3oz. per square yard. If the soil is inclined to be acid, the application of 4oz. of lime per square yard will benefit the crops.

[*Sparrow Industrial Pictures Ltd. photo.*

Silver beet is a most suitable plant for early sowing. Outside sowings should be confined to favourable areas or northern districts, but elsewhere sowings may be made in a box in a frame and the plants set out when the weather is warmer.

Outside sowing will usually be confined to specially favoured areas or to northern districts. Seed should be sown ½in. deep in rows 18in. apart, and the young plants later thinned to 9in. apart. Where conditions are not favourable it is a good plan to make a sowing in a box placed in a frame to provide plants for setting out later. No time is then lost, and when the seedlings are planted out they should not be less advanced than those that were sown outside in favoured districts.

Spinach: Prickly seeded spinach can be sown throughout winter in well-drained and cultivated soil that is not too heavy, provided the seedlings can establish themselves without danger of being lifted by frost. Spinach is a cool-weather vegetable and is usually one of the first subjects for early-spring sowing.

The soil should be well drained and cultivated. Spinach will not tolerate acid soil conditions, and if lime has not recently been applied, a dressing of 3 to 4oz. to the square yard should be worked into the ground before sowing. Quick growth is necessary to produce tender, succulent leaves and the crop should reach maturity in from 8 to 12 weeks.

A dressing made up (by weight) of 3 parts of superphosphate and 1 part of sulphate of ammonia should be applied at 2 to 3oz. per yard of row. Weekly applications of liquid manure are beneficial.

Seed should be sown sparingly ½in. deep in rows 1ft. apart and the plants thinned later to 8in. apart.

Planting and Crop Rotation

Sowing and planting of crops should be planned to get a succession of produce and also to use every square yard of ground to the best advantage for maximum yield.

Consideration should be given now to planning the forthcoming season's production.

The mistakes of the past must be remembered and plans made to effect an improvement each succeeding year. One of the first steps in garden planning is to keep in a notebook an annual record of garden activities, as this will prove invaluable for future reference. A record of crops grown should be kept and tabulations made under the following headings: "Name of Vegetable and Variety", "Date Sown", "Date Transplanted", "Planting Distances", "Crop it Followed", "Ready for Use", "Yield", and "Further Remarks" (weather, manure, etc.). These records will serve to assist the gardener to improve his plans from year to year and will also add to his store of information.

Decide the amount of land to be allotted to each vegetable and on the plan mark it off and reserve it for that particular crop.

Sow or plant each vegetable in quantities according to expected demand; some may be sown at intervals of 2 to 3 weeks, thereby keeping up a regular supply.

The following suggestions may be helpful when drawing up such a plan:—

1. Plan for continuity and variety, giving special consideration to periods when vegetables are likely to be scarce and dear.

2. Perennial crops such as asparagus, rhubarb, herbs, etc., should be planted where they will not interfere with the cultivation or rotation programme of annual crops.

3. A few straight rows are easier to plant and cultivate than a greater number of scattered short rows or beds, and needless waste of space for paths is avoided. If small quantities of seed are to be sown and the rows are long, more than one kind of vegetable may be accommodated in the same row.

4. Do not crowd plants unless space is very limited. Close inter-cropping is rarely as satisfactory as cropping with normal spacing, which makes cultivation easy and reduces the risk of the soil consolidating. However, small quick-maturing crops such as radish, lettuce, and spinach may be planted during the early stages of widely spaced crops such as leeks, tomatoes, celery, and brussels sprouts.

5. Rows should run north and south if possible, as plants will then shade one another less, and so will receive more sunlight.

6. If a garden is on a slope, it is advisable to have the rows running across rather than up and down.

7. Tall crops such as sweet corn, broad and runner beans, and peas may be used for sheltering lower-growing vegetables, but this should not be overdone, because there may be excessive shading. Pumpkins, melons, and marrows, which may overrun smaller crops, should be placed where their development will not adversely affect other vegetables.

8. Do not follow one crop with the same kind of crop or one of the same family. To avoid soil exhaustion and the build up of soil and plant diseases and pests rotation of crops should be practised. The art of cropping a vegetable garden to get all-the-year-round results is one of the most important phases of vegetable culture and it cannot be accomplished indefinitely without rotation of crops.

Rotational Cropping

Rotational cropping is based on several factors and the more important of these are as follows:—

1. The soil and crops benefit because there is less opportunity for the carry-over of diseases and pests.
2. There is better utilisation of available plant foods. Some plants make heavy demands upon the soil for certain elements while others are very modest in their demands. Again, other plants leave the soil richer in certain elements.
3. Varying soil levels are drawn upon in turn and conversely are rested in turn. Certain plants are deep rooting and take nourishment from the lower soil levels; others are shallow rooting and take nourishment from the higher soil levels.
4. Crop rotation plays an important part in weed control because crops of different habits, particularly the spreading kinds termed "cleaning" or "smothering" crops, are moved about from year to year.

Many suggestions for crop rotations have been put forward with the same broad principles in view, but that to be described may be considered satisfactory for most home gardeners. The kind of vegetables to be grown and the system of cropping must be governed not only by the kind of soil and size of the area to be used but by personal preferences.

The garden area can be divided into 4 plots, if this is considered appropriate, reserving plot 1 for permanent crops such as rhubarb, asparagus, and herbs, or for tall or rambling crops such as runner beans, pumpkins, and marrows, which need ample room because of their spreading habit. The remaining plots are for 1-year succession crops, and the 3-year plan recommended can be carried out as follows:—

Plot 2

First year: Plot 2 will consist of root crops such as carrot, parsnip, beetroot, celeriac, and salsify. Trench the ground for these crops and apply a light dressing of artificial manure only.

Second year: Miscellaneous crops such as peas, beans, celery, spinach, leeks, onions, shallots, and lettuce will follow the roots. The soil will require digging only, but plenty of farmyard or organic material should be added. Artificial fertilisers should be added to the plants as they grow.

Third year: The plot will consist of potatoes and numerous members of the brassica family and their varieties, for example, cabbage, cauliflower, savoy cabbage, broccoli, brussels sprouts, and kale. Again, digging is all that is required, but the soil should be enriched with farmyard or similar organic material.

Plot 3

Plot 3 would in the course of the 3-year plan be cropped as follows:—

First year: As for second year of plot 2.

Second year: As for third year of plot 2.

Third year: As for first year of plot 2.

Plot 4

The 3-year plan for plot 4 would be as follows:—

First year: As for third year of plot 2.

Second year: As for first year of plot 2.

Third year: As for second year of plot 2.

If the recommended rotation is practised, each group is grown on the same site only every third year and each site is trenched once in 3 years. Crops have a change of site and plots have had the advantage of being economically maintained and properly cultivated over the period.

Some gardeners may prefer to retain the system of plot rotations given, but to vary the composition as follows:—

Plots:

1. Permanent crops.
2. Deep rooting crops (carrot, parsnip, beetroot).
3. Shallow-rooting crops (onion, silver beet, lettuce).
4. Cabbage family (brassicas), cabbage, turnip swede.

In larger gardens more divisions may be considered from the following groups: (a) Permanent crops. (b) Root crops. (c) Greens or fibrous-rooted crops. (d) Tubers or vegetables which are stored (potatoes, kumaras, artichokes). (e) Legumes or pod-bearers. (f) Gourds (marrows and pumpkins).

In very small gardens it may not be possible to change the plot and in such cases the best alternative is to change the positions of rows.

Radio Broadcasts

A RADIO talk will be given to farmers from Station 1YZ Rotorua at 7.15 p.m. as follows:—

July 12—"Rotorua District Young Farmers' Clubs' Committee", by the secretary, C. R. Taylor, Department of Agriculture, Rotorua.

Talks will be given as follows from Station 3YA Christchurch at 7.15 p.m.:—

July 2—"Don't Plant too Early", by M. R. Porter, Horticultural Instructor, Department of Agriculture, Christchurch.

July 19—"Clean Milk Production", by T. A. Coulter, Supervising Dairy Inspector, Department of Agriculture, Christchurch.

The following radio talks will be given from Station 4YA Dunedin at 7.30 p.m.:—

July 7—"Planting Young Fruit Trees", by J. Coombe, Orchard Instructor, Department of Agriculture, Roxburgh.

July 18—"Factors in Production of Clean Milk", by D. Rose, Senior Dairy Inspector, Department of Agriculture, Dunedin.

Radio talks will be given to farmers from Station 4YZ Invercargill at 7.15 p.m. as follows:—

July 9—"Milking Sheds", by G. E. Hicks, Dairy Instructor, Department of Agriculture, Invercargill.

July 23—"Winton Experimental Farm", by W. Faithful, Fields Instructor, Department of Agriculture, Invercargill.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 1YD Auckland on Thursdays at 7.30 p.m., 1XN Whangarei on Mondays and Wednesdays at 8.10 p.m., 1XH Hamilton on Mondays at 8.45 p.m., 2YZ Napier on Tuesdays at 7.10 p.m., 2YA Wellington on Thursdays at 12.35 p.m., 3YA Christchurch on Mondays at 12.20 p.m., 4YA Dunedin on Thursdays at 12.35 p.m., and 4YZ Invercargill on Mondays at 12.35 p.m.

Pig Broadcast

Under the auspices of the Bay of Plenty District Pig Council a broadcast will be delivered in May as follows:—

Rotorua—1YZ, on July 26, at 12.35 p.m., "Milk Yields of New Zealand Sows", by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Control and Prevention of Fowl Pox by Vaccination

FOWL pox is an infectious disease of poultry in which the formation of nodules or warts on the comb and wattles is a diagnostic feature. Other symptoms present may lead to some difficulty in identifying the disease in the early stages. Outbreaks are prevalent in New Zealand during late autumn and early winter, but so far the disease has occurred only in the North Island. Methods of vaccination for the control and prevention of fowl pox are described by J. J. Thompson, Veterinarian, Department of Agriculture, Wellington.

AN outbreak of the disease arises from introduction into the flock of the fowl-pox virus. In common with other viruses, it is frequently called a filter-passing virus, being capable of passing through special laboratory filters which hold back bacteria. Spread of the virus is mainly by contact with "carriers"—birds which carry the virus without showing evidence of infection. Birds which have recovered from fowl pox may act as carriers to healthy birds and when introduced into a clean flock may precipitate an outbreak of the disease. Wild birds are also susceptible and may spread infection, and red mites and mosquitoes may transmit the disease from one bird to another by biting.

Symptoms

The manifestations of fowl pox vary somewhat and may be deceptive. The disease may begin with the general appearance of "roup" and be difficult to diagnose in the early stages. It appears in three forms, depending on the site of infection, and more than one form usually ocurs in the same flock.

The first form begins with running discharges from eyes and nose which later dry up, resulting in swollen eyes filled with hard, yellow, pus-like material.

In the second form the lining of the throat is covered with tough, yellow, diphtheritic membranes adhering firmly to the mucous membrane lining the mouth and throat. They are difficult to remove and leave a raw, bleeding surface underneath.

The third form is marked by the eruption of nodules on the comb, especially near the beak and nostrils, but also on the eyelids, ear lobes, and wattles. These nodules may not appear until the disease has been running for a short time, but their appearance on the head is typical of fowl pox and should be regarded as a diagnostic feature of the disease. Beginning as pinhead-sized red spots, they progress to a blister-like stage of a greyish appearance. These blisters dry up, forming brownish scabs which coalesce into wart-like eruptions. Occasionally similar lesions may occur on the vent and feet and under the wings.

The appearance of the diphtheritic membranes in the throat and mouth of a bird affected by fowl pox, the neck being sketched slit open to show the adherent patches.

Infection can be contracted only through abrasions in the comb, skin, or mucous membrane of the mouth and throat, but as birds almost always have tiny cuts and injuries from such causes as pecking, fighting, sharp stones, or grit, entry of the virus into the tissues is relatively easy.

Mortality is often low and depends on the number of birds affected by the mouth and throat form. Tough, yellow, cheesy growths on the lining of the mouth or windpipe, gradually spreading to the tongue, cheeks, nostrils, and even lungs, may cause choking and death from asphyxia. The duration of the disease depends on the condition and resistance of the flock and may vary from 1 to 4 or 5 weeks. In some flocks it assumes a chronic form and runs a course of several months.

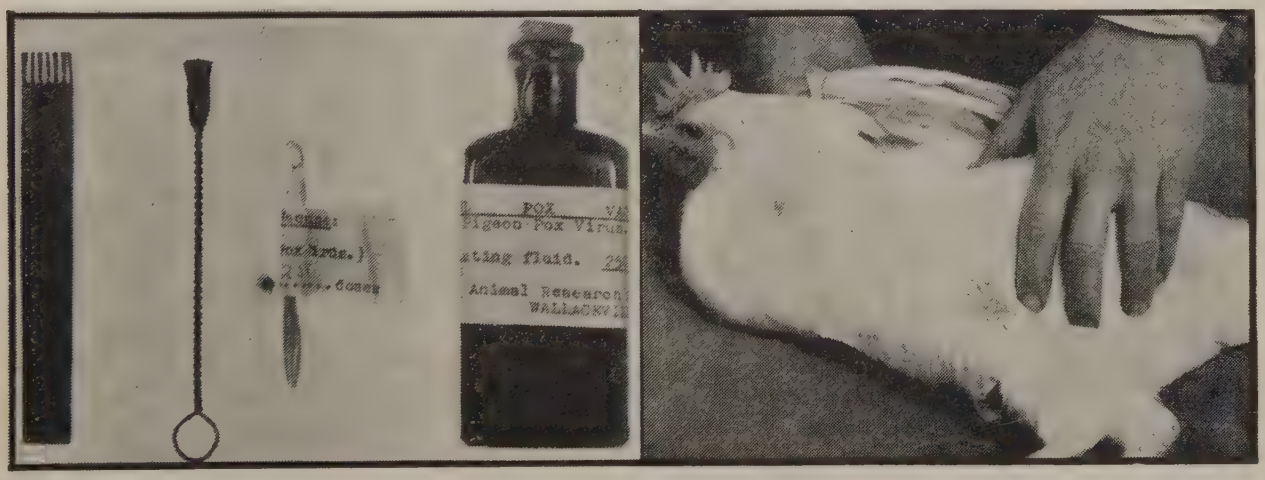
Typical fowl-pox nodules on the comb and wattles and near the corner of the mouth of a bird.

In New Zealand fowl pox causes serious loss because of lower egg production and loss in condition. Exposure to bad management, poor housing conditions, or nutritional errors tends to enhance the severity of an outbreak and its effects on the birds.

Treatment of Affected Birds

Some owners attempt treatment of the affected birds by applying tincture of iodine, but that is a rather futile practice consuming time and patience. Handling the affected birds for treatment often causes further spread of the disease in the flock.

One useful measure which should be put into effect is the provision of



Left—Equipment for vaccinating birds with pigeon-pox virus: A useful type of scraper for preparing the skin, and the brush, dried virus, and diluting fluid as supplied by the Animal Research Station, Wallaceville. Right—A bird prepared for vaccination with pigeon-pox virus. A few feathers have been removed from the outside of the thigh and the skin scraped or roughened.

wet mash while the disease is running its course. Dry mash tends to stick to the gummy discharge on the eyes and nostrils and clog them up.

Control and Prevention

Though there is no effective medicinal treatment for fowl pox, two vaccines are available. Pigeon-pox vaccine is used particularly for control of an outbreak; fowl-pox vaccine is used only as a preventive measure. Each has a different function, and care must be taken to recognise their proper roles.

Control by Pigeon-pox Vaccine

Immediately an outbreak of fowl pox is diagnosed the use of pigeon-pox vaccine is advocated. It differs from the fowl-pox vaccine in that, though it confers only a temporary immunity, it does not cause a severe reaction in laying birds. The immunity lasts only a few months, but that is a sufficient period to protect uninfected birds during an outbreak. Only the healthy birds are inoculated.

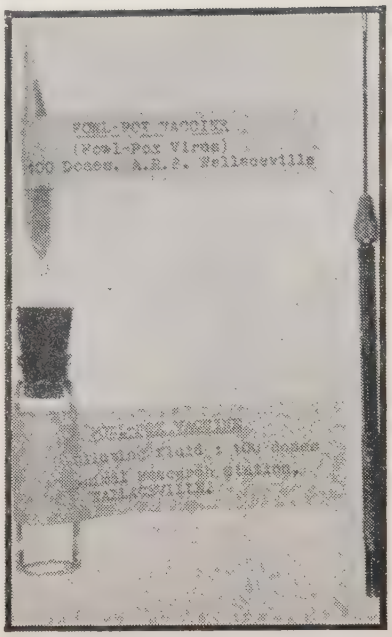
In addition to the use of pigeon-pox vaccine, the usual measures to prevent further spread of the infection from the affected pen are necessary. Affected birds should be isolated and, if possible, a separate attendant should look after them. Care must be taken not to convey infection from the infected birds on the boots and clothing. The hands and boots must be thoroughly cleaned and disinfected after working with the infected birds.

Pigeon-pox vaccine is obtainable from the Department of Agriculture Animal Research Station, Wallaceville. A small glass phial containing the dried, powdered vaccine is supplied with a bottle of diluting fluid. Before use the powder and fluid are mixed and shaken thoroughly. About 6 or 8 feathers are plucked from the outside of the bird's thigh and the exposed feather follicles roughened a little with a scraper until the skin is red. The vaccine is then applied to the follicles with a small brush. Normally a local reaction evidenced by the formation of a scab occurs in about 7 days, but egg production is affected little or not at all. This method of applying the vaccine is known as the "follicle method".

Prevention by Fowl-pox Vaccine

After extensive trials for 2 years, first at the laboratory and later in the field using large numbers of birds, a fowl-pox vaccine has been issued by the Animal Research Station for general use. This vaccine differs from pigeon-pox vaccine in several respects. It confers a permanent immunity against fowl pox, but the systemic or body reaction is more severe. Consequently, fowl-pox vaccine is used only on birds 8 to 12 weeks old and never on laying birds. This vaccine should be used only on farms where fowl-pox outbreaks have occurred in previous years or where there appears to be danger from neighbouring infected farms.

The dose of fowl-pox vaccine required to produce immunity is much smaller than that of pigeon-pox vaccine, so a different method of vaccination is used. The technique is much simpler and more easily carried out than the follicle method. This operation, known as the "stab method", requires very simple preparation and equipment. The needle used to inoculate the birds is prepared by removing the extreme tip of the eye from a large darning needle with pliers or by filing it to leave two prongs. The sharp point of the needle may then be inserted into a large cork or wooden penholder to form a convenient handle. The needle prongs dipped into the bottle of prepared vaccine pick up sufficient fluid to vaccinate one bird. Each bird is caught and held by the catcher with its left leg in the left hand and its tail in the right. The vaccinator pulls back the feathers from the fold of skin between the bird's thigh and tail and pushes the needle loaded with vaccine straight through the skin. This simple method allows a very rapid rate of vaccination if enough efficient helpers are present to catch and hold the birds.



Above—Equipment for vaccinating birds with fowl-pox vaccine: The dried virus and diluting fluid, as supplied by the Animal Research Station, Wallaceville, and the type of needle used. The needle has been inserted in a metal holder, but a large cork or piece of wood serves equally well. Below—The technique of fowl-pox vaccination: If one leg and the tail of the bird are held, the vaccinator can pull back the feathers and push the needle through the fold of skin between tail and leg.

Fowl-pox vaccine must be handled with reasonable care, as careless use or distribution of this live vaccine may precipitate an outbreak of fowl pox among susceptible birds. Vaccine bottles and unused vaccine should be disposed of carefully.

If the vaccination has been carried out properly, a small brownish-yellow scab will appear at the point of injection within 7 days, indicating a satisfactory "take". A relatively mild body reaction occurs between 2 and 3 weeks after vaccination. The birds may go off food for a day, but recover quickly. To minimise this body reaction, careful observation of the vaccinated birds to ensure that they are not subjected to sudden changes in management, feeding, or housing is necessary. If worm infestation, vitamin A deficiency, or other debilitating conditions are present, the body reaction is much more severe in its effects.

To obtain good results in the prevention of fowl pox by the use of fowl-pox vaccine, certain preliminary precautions are necessary. Only birds 8 to 12 weeks old should be vaccinated. The birds must be in good condition and free from parasites, particularly worms, and coccidiosis. A well-tried and recommended procedure is to carry out deworming with carbon tetrachloride at the same time as the vaccination, which eliminates double handling of the birds and saves time.

Applications for Vaccine

Supplies of both vaccines may be obtained from the Animal Research Station, Wallaceville. Pigeon-pox vaccine is supplied in a minimum quantity of 250 dose lots at a cost of 1d. per dose. Fowl-pox vaccine at present is supplied free. Applications should state clearly which type of vaccine is required.

The diagnosis of fowl pox is sometimes fairly simple, but should any doubt exist, it is advisable to consult the nearest Veterinarian or Poultry Instructor of the Department of Agriculture and to send several affected live birds to the Chief Diagnostic Officer, Animal Research Station, Wallaceville, for post-mortem examination.

Further information about vaccination may be obtained either from the local Poultry Instructor through the district office of the Department of Agriculture or from the Veterinarian (Poultry), Department of Agriculture, P.O. Box 3004, Wellington. If necessary, a demonstration of the method of using the vaccine will be arranged.

Research in Animal Breeding in Britain and U.S.A.

After representing New Zealand at the Review Conference of the Commonwealth Agricultural Bureaux, held in Britain last year, J. F. Filmer, Director of the Animal Research Division, Department of Agriculture, Wellington, spent a month visiting animal research institutions in the United Kingdom and a similar period in North America. His impressions of the animal research work being undertaken in Britain and the U.S.A. and observations of the approach of those countries to problems of animal breeding were given in a paper which was delivered last month at the Ruakura Farmers' Conference week and which is printed below.

ANIMAL breeders in New Zealand have done a very good job. Probably no other country in the world has 1¾ million cows which would produce more butterfat under New Zealand conditions than our own cows produce. It is equally doubtful if any other country has 20 million ewes which, under our conditions, would produce more money from wool and fat lambs than do our own flocks. But no thoughtful breeder would suggest that there is no room for improvement. The production of our best herds and flocks is well above the national average and within all herds and flocks there is considerable variation between the yields of individual animals. Moreover, it is doubtful if the average production per cow or per ewe is materially greater today than it was 10 years ago. How can the national average be raised to the level of our best herds and flocks? How can the flock and herd average be brought nearer to the level of the best ewes and cows within them? Those are the problems which we have to solve, and in New Zealand they are proving difficult problems.

During my recent visit to Great Britain and America I therefore took every opportunity to learn how animal breeders in those countries were tackling these problems and what sort of results they were achieving.

In Great Britain there is a very great revival of interest in animal breeding. A few years ago British breeders advertised widely that Great Britain was the stud farm of the world and that the quickest way to breed better stock was to import British sires; that idea is still very popular, but there is a growing realisation that even British stock can be improved. The Agricultural Research Council has recently purchased six properties which are to be used as new animal breeding research stations—two each for cattle, sheep, and pigs. In America, too, animal breeding is a very live subject.

Line Breeding and Hybrid Vigour

In America any discussion on animal breeding leads almost immediately to the twin topics of line breeding and hybrid vigour. Outstanding success has been achieved in maize breeding by crossing inbred lines, and this has had a tremendous influence on nearly all animal breeding investigations. Line bred bulls, rams, boars, and cockerels, or sires resulting from crossing inbred lines, are already available. But little or no reliable information could be obtained about the relative production of their progeny. It is necessary to notice one very important difference between the programmes for breeding maize and animals. Hybrid maize seed results from crossing two parent lines each of which has been obtained by crossing two different inbred lines. The animal sire produced by crossing two unrelated line bred parents is mated to females which are usually not line bred.

One of the most interesting investigations of line breeding is being conducted at the Sheep Experiment Station at Dubois, Idaho, U.S.A., where work is being done with the following three breeds of sheep: the Rambouillet, a plain-bodied type of Merino; the Columbia, half Rambouillet and half Lincoln; and the Targee, three-quarters Rambouillet and one-quarter Lincoln.

In each breed a number of lines have been developed and inbreeding has been practised within each line. The stage has now been reached where crossing of lines is starting. The presence of three breeds, the large number of lines, and now their division for crossing have reduced the ewes in each line to quite small numbers. Some very fine sheep have been bred; but it is not easy to determine how far line breeding has contributed. No progress has been made in increasing total wool production; percentage of yield of clean scoured wool and staple length are still rather low, while carcass size and conformation are good, and there is very little wool blindness, which used to be a problem.

These sheep are being bred under difficult natural conditions. Three different areas are used for winter, spring, and summer grazing, and the sheep have to travel 200 miles every year. Break and tenderness in their wool, however, were not common. An annual ram sale is held on the property. No special feeding or fancy barbering is practised; in fact rams are sold a few weeks off the shears. Full particulars of weight of fleece shorn and clean scoured

[*National Publicity Studios photo.*

Ruakura Animal Research Station. Dr. Filmer states that work will be done there on some of the "number of ideas which appear to be worth incubating" which he noted overseas.

yield for the ram and for the line from which he comes are made available to buyers. This was in marked contrast to the preparation given to some young Hampshire Down rams in England. They were grossly over-fat; their backs were shorn flat with sharp edges, and their wool was dyed a brilliant orange.

At Edinburgh the Agricultural Research Council is embarking on an important line breeding project with Large White Yorkshire pigs. The buildings set a new high level in pig housing, the pens being constructed of concrete with hollow tile floors, double windows, and thermostatically controlled radiators. Accommodation is being provided for 120 sows and almost as many boars. In the first instance pigs will be purchased from any breeders who have practised line breeding. Each line will be inbred and at a later date the lines will be crossed and the boars from these crosses sold to commercial breeders. Careful records will be kept of the progeny of these boars to determine if they are superior to their half sisters by other boars.

Cross-breeding

Cross-breeding for meat is, of course, an old and well-established practice. At Beltsville in America experiments are being conducted on the crossing of different breeds of dairy cows. At this very large experimental station of the United States Department of Agriculture cows are kept indoors, are fed standard rations, and are milked 3 times daily for 365 days per year.

Four breeds of cows are kept—Jersey, Guernsey, Friesian, and Red Dane. Jersey, Friesian, and Red Dane proven sires were available, and these were each crossed with cows belonging to the other three breeds. Records are available for 54 2-year-old two breed cross heifers and these averaged 585lb. of fat. Their purebred dams at the same age averaged 442lb. of fat. Progeny of the same sires out of cows of their own breed did not show nearly such a spectacular improvement over their dams. A number of the two breed cows were mated to a bull of a third breed, and 2-year-old records are now available for 41 three breed crosses. These averaged 606lb. of fat compared with a production of 607lb. of fat by their two breed dams at the same age.

Reports of this experiment have met with a rather mixed reception in America. A similar experiment is to be started by the Agricultural Research Council in Edinburgh. Jerseys, Friesians, and Ayrshires will be used, and in the foundation herd there will be 40 cows of each breed. To avoid any bias from a particular bull, semen will be used from an artificial insemination centre on a random basis. Whatever semen is offering will be used on the day a cow is mated, provided it comes from a bull of the right breed. Thirty per cent. of the cows in each breed will aways be mated with sires of their own breed. The remainder will be mated with sires of a different breed, and their two cross progeny will be mated with sires of a third breed. The results of this experiment will be awaited with great interest.

Another most interesting experiment at Beltsville is the crossing of Jersey cows with Red Scindi bulls. The Red Scindi is a milking strain of humped Indian cattle. Although its production is higher than that of most other Indian cattle, it has never approached that of good Jerseys. In the Beltsville experiment, however, the crossbred cows produced at the same level as the Jerseys. This experiment needs to be repeated under tropical conditions, but it does suggest that this cross may prove useful in tropical countries if a reasonable standard of feeding can be provided.

At Compton in England a herd of Ayrshire cows have been mated to a Red Poll bull as a first step toward breeding a hornless strain of Ayrshires. Further steps will include top crossing with Ayrshire bulls and the use of selected crossbred bulls. In selecting the latter it is possible to exclude bulls which carry the factor for horns, as they bear either small loose horns known as scurs or hard knobs under the skin at the horn site. In crossbred bulls which do not carry the factor for horns these are absent.

Theoretically it should be possible by the above methods to breed a herd of cattle which have all the characters of Ayrshires except their horns. At present the herd shows great variation, especially in the shapes of the udders. If the experiment proves successful, there would appear to be no reason why the horns could not be bred off any breed of cattle by a similar cross.

Progeny Testing

In New Zealand during the last 10 years the attention of breeders, especially breeders of dairy cattle, has tended to be increasingly concentrated on progeny testing. In this system an attempt is made to locate bulls whose progeny are better producers than the progeny of the average bull. It is suggested that by the continued use of such bulls it will be possible to breed cattle which will breed true for high production. No attention is paid to the relationship between cows and the bulls to which they are mated. In other words an attempt is made to breed for production without line breeding. I think it may be fairly stated that both line breeding and progeny testing are still on trial, and it is well that they should be.

One of the obvious difficulties in applying the progeny testing method is the tremendous effect environment has on the progeny test of a bull. Let me give you a New Zealand example. At Ruakura we have used in the A.I. work two bulls with official sire surveys of 451lb. and 373lb. of butterfat respectively. The bull with a sire survey of 451lb. now has 118 artificially bred daughters in milk with an average production of 348lb. of fat. (All figures are on a maturity basis.) The bull with a sire survey of 373lb. has 28 artificially bred daughters in milk, and their average is 346lb. of fat. It would appear that these bulls have almost exactly the same inheritance for butterfat production, but there was 78lb. difference between their official sire surveys. One can only conclude that in the official surveys the progeny of one bull were better treated than those of the other.

Another New Zealand example: In an experiment at Ruakura extending over 3 years some identical twin cows were fed concentrates at the rate of 2lb. per gallon of milk produced, and in addition were grazed on very good pasture. Thirty lactations from 18 cows averaged 422lb. of butterfat. Very few bulls in New Zealand have a sire survey higher than 422lb. But these cows had been selected as calves simply because they were identical twins. They were probably by 18 different bulls of average quality.

Now an overseas example: In Denmark 6 cows were selected in a commercial herd and it was decided to see how much they could be made to produce. They were housed under the best conditions; they were milked 4 times daily by expert milkers; they each received the following astounding ration daily—60lb. of swedes, 9lb. of hay, 9lb. of silage, and 35lb. of concentrates. In the two seasons before the experiment they had produced 359lb. and 370lb. of butterfat respectively. In the experimental season they produced an average of 909lb. of butterfat—nearly 2½ times as much as their previous best production. What would you pay for a bull with a sire survey of 909lb. of butterfat?

These three examples show how very important the effect of environment can be in making a sire survey. Discussions with overseas workers indicated that they are conscious of this difficulty.

In Denmark progeny of bulls being surveyed are brought together on special farms and are fed and milked under standard conditions. This enables them to compare one bull with another, but it leads to disappointment when the bulls are used on farms where the conditions are not as good as those of the test farms.

In Great Britain the Milk Marketing Board is trying out a different system. Each year 5 yearling bulls will be used at each A.I. centre. Semen from these bulls will be distributed to all farms serviced in a purely random way. The production of their progeny will later be measured on the farms on which they are bred. Each bull will in this way be represented by progeny on a number of different farms, and their average production should give some real indication of his breeding merit. Over 100 yearling bulls are to be surveyed each year in this way. As it is possible that differences may exist between the areas serviced by the various A.I. centres, the semen from one bull in each centre will be distributed to 4 surrounding centres as well as to the farms serviced from his own centre. This appears to be a well-thought-out plan, and the results should prove very interesting. It is hoped to initiate a similar plan at Ruakura using yearling sons of proven sires out of high-producing cows. Collaboration of dairy farmers in this work is likely to be requested in the near future.

The staff of the Herd Improvement Department of the New Zealand Dairy Board have, of course, always been very conscious of the great importance of environment. They first sought to assess its effect in individual sire surveys by making daughter-dam comparisons within the same herd in the same year. Unfortunately only a relatively small number of such comparisons could be made, and they do not always give a true assessment of the sire's real merit.

More recently the practice has been adopted of comparing the average production of the sire's daughters with the average production of all mature cows in the herd in the same season. The following table sets out the position in regard to the two bulls referred to earlier:—

Bull	Official surveys	
	Daughters Av. b/fat lb.	Dams Av. b/fat lb.
A	451	367
B	373	346

In this case the daughter-dam comparison is flattering to bull A, but the comparison of daughters' production with that of the mature cows in the same herds gives a very good assessment of the relative merits of the two bulls.

Progeny testing is still the best known method of assessing a bull's real worth.

Every "merit bull" used at Ruakura has proved to be a good bull, though not always as good as his official sire survey suggested. It is still wise to buy a "merit bull" if one can be found. But if you want to know what he will do in your herd, inquire very carefully about the conditions under which he was surveyed, and note how they compare with yours. Remember those ordinary cows in Denmark which produced 909lb. of butterfat!

What has been said might perhaps appear to indicate that feeding is more important than breeding. The truth is that breeding is always important. Experiments with identical twins and with artificial insemination at Ruakura have shown that well-bred cows produce more than poorly bred cows even when both are poorly fed.

Selection on Performance

Perhaps the oldest idea in breeding is that like begets like. Even when breeding for performance it sometimes works quite well; for example, if you want to breed a fast horse, use a thoroughbred sire. His progeny may not gallop as fast as you would wish, but they will be much faster than the progeny of a draught stallion.

An interesting example of this method of breeding was seen at Miles City in Montana, U.S.A. Here an experimental station is investigating the breeding of Hereford cattle. It was found that there was a considerable difference in the rate at which different bulls grew during their first 2 years. Further investigations showed that the progeny of the bulls grew at approximately the same rate as their sires. By selecting for rapidity of growth the station has evolved a type of Hereford which, under quite hard range conditions, reaches forward store condition at 2 years of age, and requires only 2 to 3 months' grain feeding to kill at 550 to 600lb.

One very important finding is the fact that the rate of growth does not affect the appearance of the bulls at maturity. A rapidly maturing bull cannot be picked on his looks. It seems possible that this principle can be applied to fat-lamb breeding. If some Southdown rams grow faster than others, they may pass this character on to their offspring. It is intended to have a look at this question at Ruakura.

Fundamental Experiments in Breeding

Experiments to determine the fundamental principles of genetics are not often conducted with domesticated animals, because they would be too slow and too expensive. A truly fundamental experiment has, however, been planned by the Agricultural Research Council in Scotland, using Scottish Blackface sheep. A large estate has been bought in the Highlands, and it is intended to run 3 groups each of 1000 ewes in exactly the same environment. In the first group no selection will be practised and sufficient ram lambs will be reared within the flock each year to mate with the ewes. Any variation in the wool production of the ewes will thus depend entirely on variations in their environment. In the second group an attempt will be made to increase the wool production, and in the third group an attempt will be made to decrease the wool production.

Artificial Insemination		
Mature cows Av. b/fat lb.	Daughters Av. b/fat lb.	Mature cows Av. b/fat lb.
430	348	319
360	346	322

This is a very important experiment. If real differences in wool production are produced, it will be possible to say that they are really due to the breeding methods used. Only too often animal breeders have attributed improvements to breeding which were really due to improved environment.

Because of the cost and the slowness of fundamental breeding experiments with domesticated animals, some preliminary experiments are being conducted with mice at Edinburgh. One experiment will serve as an example. It is strongly held by some animal breeders that to pick the best animals to breed from they must be given the very best environment.

An experiment was conducted with mice to test this theory. An inbred line of mice was divided into two similar groups, one of which was fed on a ration above normal level and the other on a ration below normal level. Efforts were then made to breed bigger mice and after a number of generations the size was increased in both groups. They were then placed on the same intermediate level of nutrition and it was found that the mice bred on the low plane of nutrition were actually bigger than those bred on the high plane. This should, of course, not be used as an argument for under-feeding, but it does show that over-feeding of stud stock is not necessary.

In another experiment the methods of inheritance of milk secretion were studied in mice. The following paragraph is quoted from the introduction to the paper describing the results:—*

> Mice, with their rapid and prolific breeding, possess many advantages for the experimental study of lactation, and allow genetical experiments to be made on a scale that would be impracticable with cattle. The logical analogy between mice and cows would, of course, require justification, and knowledge about lactation in mice could not be applied indiscriminately to the improvement of the milk production of cows. Nevertheless, if a plan for the improvement of milk production had been tried on mice and had failed, much faith and courage would be needed to put it into operation on a herd of dairy cattle. Experiments on the lactation of mice might, therefore, be of considerable prognostic value to the dairy-cattle breeder, and also supply more fundamental knowledge of lactation in general.

It does seem that mice might be used in New Zealand for some preliminary experiments in this way.

Mechanics of Reproduction

Brief reference may be made to some extremely interesting investigations at Cambridge into the mechanics of reproduction. It is well known how, by A.I., the number of descendants of an outstanding bull can be greatly increased. It is now suggested that outstanding cows can also have the number of their progeny multiplied. By injecting hormones into the cow she can be persuaded to produce many eggs instead of one or two at each heat period. These can all be fertilised with semen from a proven sire, and a method has been devised for collecting the fertilised eggs from the uterus. Each of these is then placed in the uterus of another cow—any sort of cow—which has just passed a heat period.

In this way it would be possible to produce in one year 100 calves, all sons and daughters of one outstanding cow and one proven sire. Rabbits, sheep, and goats have been successfully bred from transferred fertilised eggs. There is thus nothing fantastic in the idea. So far, however, no calf has been born alive from a transferred fertilised egg, though on several occasions development has proceeded in the foster mother for several months. It may be that some day we shall import from England a dozen fertilised eggs from a champion cow at about the same price as a dozen fertilised hen eggs! Whether or not this vision ever materialises, it is certain that much valuable information will come from the investigation. Let me give two examples.

It has been shown that when a fertile bull is used almost 100 per cent. of his matings result in fertilised eggs; 100 per cent. of calves do not result, because a considerable percentage of the eggs die within a few weeks of fertilisation. This has directed the investigation of sterility to a new avenue of research which may well prove to be very fruitful.

The experiments aimed at producing many eggs at each heat period have shown that the number of young which result may be controlled by the dose of hormone and the time at which it is injected. It is suggested that if a "teaser" ram is run with ewes, and a carefully measured dose of hormone injected 12 days after the ewes are marked by the teaser, 2 to 3 lambs will result from mating with a fertile ram at the next heat period. This practice should be quite feasible for fat-lamb breeders, and, if successful, should prove very profitable. It is to be tried at Ruakura next season.

I trust that enough has been said to show that a great deal of very active research in animal breeding is going on in both Great Britain and America. There are not many new discoveries which can be applied immediately in New Zealand. There are, however, a number of ideas which appear to be worth incubating, for nothing more fertile than an idea has ever been conceived.

* D. S. Falconer (1947), J. Agric. Sci., 37, 3, 224.

CARE OF LIVESTOCK DURING JULY

Contributed by the Animal Research Division

PULPY KIDNEY IN LAMBS

WHERE pulpy kidney occurs in lambs under 6 weeks of age its incidence can be reduced by vaccinating the ewes before lambing. If ewes have never been vaccinated before, best results will be obtained from 2 doses of vaccine given at least 1 month apart. Ewes which were vaccinated last year will require only one vaccination. The last (or the only) vaccination should be given about a fortnight before lambing and this can be done quite safely if ewes are handled carefully. Very poor immunity results where the ewes are vaccinated much earlier. If most losses from pulpy kidney occur in lambs over 6 weeks of age, vaccination of ewes is of no value, but vaccination of lambs at marking may help.

BLOOD POISONING IN EWES AND LAMBS

Losses from blood poisoning in lambing ewes and marked lambs may be greatly reduced, if not eliminated, by vaccinating the ewes with blackleg vaccine about a fortnight before lambing. As the immunity which passes from the ewe to the lamb in the first milk does not persist for many weeks, lambs should be marked early. To obtain the best results it may be necessary to divide the ewes into early and late lambers, which should be vaccinated separately to ensure that all ewes are vaccinated from 10 to 20 days before lambing. Advice concerning vaccination can be obtained from any office of the Department of Agriculture. Where possible ewes should lamb in clean spelled paddocks, and lambs should always be marked in clean temporary yards.

SLEEPY SICKNESS IN EWES

Heavy losses from sleepy sickness sometimes occur in ewes carrying twins or heavy single lambs. These losses may be prevented by ensuring that ewes do not suffer a check just before lambing. If necessary, they should be divided into early and late lambers and drafted on to the best feed available 3 to 4 weeks before lambing. Research has shown that poor feed for 5 weeks before lambing can reduce the fleece weight by more than ½lb.

ERGOTISM IN CATTLE

Hay made from ergotised grass will cause lameness and sometimes even loss of feet in cattle. The small black ergots which replace the seeds of ryegrass and other grasses can easily be seen, and if they are present in large numbers, the hay should not be used. Similar trouble often occurs when cattle are grazed on tall fescue grass even when no ergots are present. This grass should be regarded as poisonous and should not be grazed by cattle.

WINTER FEEDING OF COWS

It is imperative that cows should be well fed for 6 to 8 weeks before calving. They should have access to hay at all times, and if the pasture is poor, they should also receive up to 20lb. of silage per day. Early-calving cows should be given about 2 hours' grazing per day on autumn-saved pasture and in addition should be fed as much silage as they will eat.

RINGWORM IN CALVES

Ringworm in calves is sometimes troublesome, especially in poorly nourished calves. Before applying any remedy the scales should be removed by rubbing in a mixture of equal parts of soft soap and lard and scraping off the softened scabs the next day. The bare patches should then be dressed with an ointment consisting of 1 part of salicylic acid and 8 parts of lard or any registered stock remedy for ringworm which is available. As the infection can be transmitted to man, it is wise to wear rubber gloves when treating ringworm. In any case the hands and arms should be thoroughly washed immediately after the dressings are applied.

SCABBY MOUTH VACCINE

The vaccine to prevent scabby mouth (contagious ecthyma) in sheep prepared by and issued from the Department of Agriculture Animal Research Station at Wallaceville for the past 10 years is now available commercially. During the earlier years preparation was on an experimental basis to test methods of manufacture and use and to determine the efficiency of the vaccine. Making vaccines under these conditions is a service the Department of Agriculture gives as part of its work for the protection of animal health. During the past 5 years, since the value of vaccination against scabby mouth has been proved and has become more widely known, the demand for the vaccine has increased enormously. Nearly 1,000,000 doses were issued in 1950—about 50 times the quantity issued 5 years earlier.

Where the demand reaches such a level the Department considers that the work of manufacture is best left to commercial interests so that the time of research officers may be freed for the study of other diseases. Therefore the Department has stopped making scabby mouth vaccine, which is no longer available from Wallaceville. It can now be bought from the Trentham Veterinary Laboratory, P.O. Box 29, Upper Hutt. Farmers who have not used this vaccine previously should consult a Veterinarian or Inspector of Stock about the method of vaccination.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during April and for the 9 months ended April 30, 1951, with comparative figures for the same month and 9-monthly period of 1950, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	% Inc. or dec.	Total tons In store at end of mth.
April, 1951 ..	8,496	230	8,726	—	39,207
April, 1950 ..	5,064	198	5,262	—	26,245
Inc. or dec. ..	+3,432	+32	+3,464	+65.830	+12,962
For 9 mths. to 30/4/51 ..	144,721	2,851	147,572	—	—
For 9 mths. to 30/4/50 ..	138,320	2,725	141,045	—	—
Inc. or dec. ..	+6,401	+126	+6,527	+4.627	—

CHEESE

Period	White	Tons Coloured	Total	% Inc. or dec.	Total tons In store at end of mth.
April, 1951 ..	8,443	—	8,443	—	31,074
April, 1950 ..	5,670	1,720	7,390	—	28,286
Inc. or dec. ..	+2,773	—1,720	+1,053	+14.248	+2,788
For 9 mths. to 30/4/51 ..	94,167	1,526	95,693	—	—
For 9 mths. to 30/4/50 ..	72,528	20,536	93,064	—	—
Inc. or dec. ..	+21,639	—19,010	+2,629	+2.824	—

If these figures are converted into butterfat equivalent, there is an increase of 4.194 per cent. in butterfat graded for the 9 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Winter Work on the Farm

Seasonal Notes Contributed by the Extension Division

AT this period of the year work on farms is generally confined to tasks which have been held over for the winter, and much profitable time can be spent in the farm workshop in carrying out the many repairs and adjustments necessary. With the scarcity of pasture there is the important job of feeding out or in making the best use of grass available. On dairy farms the practice of storing grass for this period is increasing. On arable farms plans are being made and seed supplies are being ordered for spring-sown crops.

* * *

REPAIRING FARM MACHINERY

An annual overhaul of all farm implements and machinery is essential. It is a job to be done in winter when the weather restricts outdoor activities and affords time for attention to machines and implements required to begin seasonal work in sound mechanical condition. To this end all equipment should be systematically checked for possible defects. Defects arising and temporarily repaired during the previous season's operations should have been noted at the time as a precaution against oversight at the annual overhaul. List all broken, worn, or otherwise defective parts requiring attention; check each item off the list immediately repairs have been effected. Many repairs can be done in the farm workshop. Major repairs, especially of a technical nature, will require the services of a machinery agent or a qualified farm machinery mechanic. A Department of Agriculture Farm Machinery Instructor should be consulted for advice and guidance if there is any doubt as to the course to follow.

MACHINERY MAINTENANCE

Care in both operational and storage maintenance of implements and machinery is the surest way to keep down otherwise costly repair and replacement charges. It is a safeguard against inefficient functioning of machines, besides prolonging their working life and consequently lowering operational costs. All items that are to remain idle over a period should be thoroughly cleaned and, where necessary, lubricated before storage. Parts liable to rust should be proofed with paint, oil, grease, or special rust-resisting compounds. All implements and machinery should be protectively housed and, where necessary, dust-proof covers provided.

THE FARM WORKSHOP

Today most farms possess sufficient machines to warrant a well-equipped farm workshop. A well-lighted building with 300 to 400 sq. ft. of concrete floor space and a 9ft. stud should prove adequate for the average mechanised farm. More space and up to a 12ft. stud may be required where large header harvesters are repaired. A pit should be provided to facilitate working beneath heavy machines, with an overhead hoist available for heavy lifts. Other major items of workshop equipment which greatly facilitate farm repair and maintenance work would include a hand forge and anvil, engineer's, carpenter's, blacksmith's leg, and pipe vices, sawbench, wall or power drill, grinder, and a suitable assortment of hand tools.

* * *

FEEDING WINTER-SAVED PASTURES

IN most North Island dairying districts grass continues to grow until the end of June and fields shut up in late April will generally be ready for the first feeding in late June or early July and a second grazing in late August or early September. Fields closed in May-June will provide feed for July-August. The grass should be fed off when it reaches a height of 7 to 8in. and, providing the grazing off is not too close and pugging does not occur, the area will recover quickly and give a second feeding off. If fields have been closed too early and allowed to grow to 7 to 8in. a month or so before they are required, they should be grazed down quickly to 3 to 4in. and spelled again for grazing after calving. This rapid but lenient grazing is necessary to refresh the clovers by letting light into the bottom pasture and to ensure the quickest possible recovery of the pasture after grazing.

AVOIDING SWARD DAMAGE

Undue rankness in saved pastures should be avoided, as a heavy grass growth suppresses white clover and the underlying grass is apt to decay. This stale pasturage will start to decompose and will become yellowish, musty, and unpalatable. Recovery after feeding off will be slow too. Yorkshire fog tends to increase in pasture shut for saved grass, particularly if rankness is allowed to develop. Rotation of autumn-saved areas around the farm and avoiding too long a storage period help to reduce the trouble. There is the other aspect though, where, in pastures of high clover content and consequently grave bloat risk, the reduction in clover and the provision of more balanced and mature feed over the danger period are of considerable value.

METHOD OF FEEDING

The method of utilising winter-saved grass is one of the most important aspects, for on it wholly depends the success of the system of saving autumn pasture. Rationing on a break-feeding basis is not only desirable but essential, and for this use must be made of the electric fence. Complete utilisation, giving maximum benefit and returns, can only come by fencing off small breaks each day with an electric fence. The size of the break to be fed off will depend on the size of the herd and the quality and quantity of the feed available. An acre of saved pasture 7 to 8in. high should be sufficient for 100 cows for 1 day, that is, 45 to 50 sq. yds. per cow per day, and the size of the break can be worked out accordingly. It must be remembered that this autumn-saved pasture is to be used until the spring growth begins, and if there is only a small quantity saved, it is better to reduce the size of the break than to have it all eaten out before normal pasture growth comes away. Where possible, a separate break should be made for day and night grazing, allowing two-thirds of the daily ration during the day and one-third at night.

* * *

BARLEY VARIETIES

IT has been usual to regard malting barleys and grain-feed barleys as distinct, but today much of the barley which is used for feed is of varieties commonly regarded as grown for malting. Thus Research, the most widely grown variety at present, is a recently introduced Australian malting variety very suitable for direct heading. It has become very popular with farmers for this reason, but is not so favoured by maltsters because of its unevenness in maturity, which affects its malting quality. As a result much of the harvest of Research goes for feeding. Golden Archer has also come to the fore in recent years and is a good malting barley. Other standard varieties are Chevallier, Spratt Archer, and Plumage Archer. Kenia is a recent introduction which is also a good direct-heading variety and is well regarded by maltsters. Certified seed of all but Research is now available.

FEED BARLEY

Cape and Black Skinless barleys are not malting types. Cape is grown, though to a less extent than formerly, for feed grain and for greenfeed, while Black Skinless is grown on a limited scale chiefly for greenfeed. Seed of Wong barley was distributed last autumn for the first time. This variety is suitable for greenfeed only and should be harvested for grain only to maintain seed supplies. It differs from other barleys in that though its initial production is not so great, it is able to withstand successive grazings.

Combined Uncapping Can and Cappings Press

ALL methods of uncapping bee combs for extraction of honey entail the removal of a considerable quantity of honey with the wax cappings, and heat is usually applied to separate the honey from the wax. Where honey and wax cappings are dealt with in this way there is a danger of overheating the honey and spoiling its natural colour and flavour. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, describes a combined uncapping can and cappings press used by Mr. B. G. Sharp, of Matakana, North Auckland, to deal with cappings without injury to the honey. The press has proved most effective and economical to operate and is easily constructed.

THE materials required to build the press are:—

One tinned metal tray 22½in. in diameter x 6in. deep fitted with a standard-type honey gate with a 1¼in. outlet.

One circular bottom board 21¾in. in diameter made of 1in. timber with 5 supporting crossbars each ¾in. x ¾in. attached to each side of the board. The board is covered on one side with a piece of Chrysler queen excluder.

One wooden follower 19½in. in diameter, 1½in. thick, and strengthened by wooden slats on each side ½in. wide and ½in. thick and set ½in. apart as illustrated below. The follower is also covered on one side with a Chrysler queen excluder.

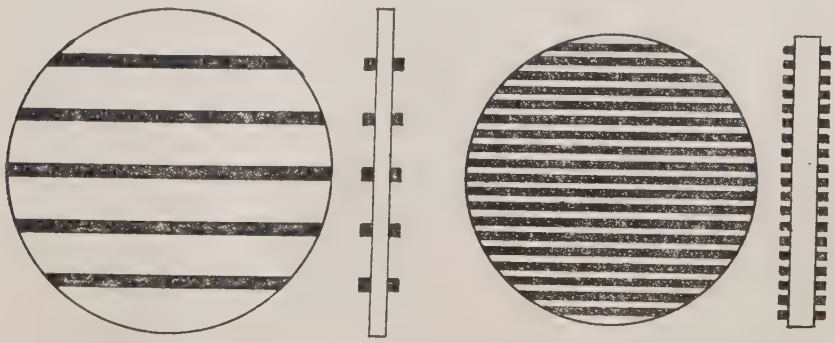
One basket 21¾in. in outside diameter and 12in. deep. This is constructed of top bars of Hoffman frames with the grooves widened to ⅜in. and deepened to ¼in. and is supported and held in shape by two tinned metal hoops each 2in. wide.

One uncapping bar 22½in. x 2in. x 1in.

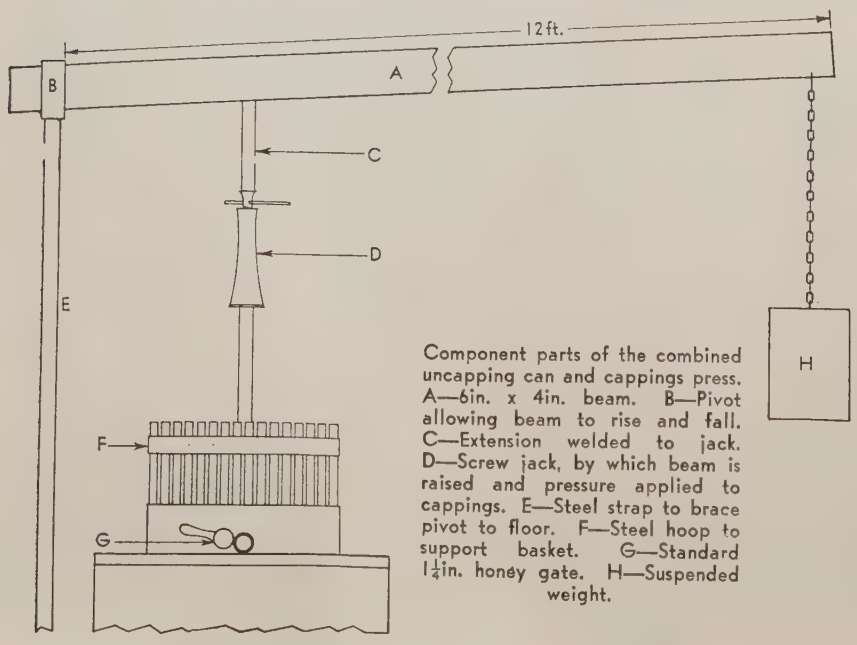
One screw jack of the type used to lift lorries or tractors and with not less than 12in. lift. A tractor jack with an extension welded to the top is quite satisfactory.

One steel disc 9in. in diameter to sit between the foot of the jack and the follower.

One piece of 6in. x 4in. timber of good quality. The length will depend on the space available. In the original design a length of 12ft. has given excellent results.



Left—Plan and sectional view of circular bottom board with supporting crossbars. Right—Plan and sectional view of wooden follower, showing arrangement of wooden slats.



Component parts of the combined uncapping can and cappings press. A—6in. x 4in. beam. B—Pivot allowing beam to rise and fall. C—Extension welded to jack. D—Screw jack, by which beam is raised and pressure applied to cappings. E—Steel strap to brace pivot to floor. F—Steel hoop to support basket. G—Standard 1¼in. honey gate. H—Suspended weight.

Comb in position for removing cappings into the basket and tray of the uncapping can and cappings press.

Sufficient steel 2in. x ¼in. to anchor the pivots of the beam securely to the floor. Apart from the tray, for the construction of which the services of a tinsmith or plumber will probably be required, the manufacture of the circular bottom board, follower, and basket should be well within the capabilities of any beekeeper who has simple wood-working machinery available.

Method of Use

The circular bottom board is placed in the tray with the excluder side upward and the wooden slat basket set on top of the board. The basket is then lined with well-washed scrim or hessian and the uncapping bar is placed in position. Cappings fall directly into the basket, which is of sufficient size to hold the cappings of from 20 to 25 supers, about 4 hours' work for one man. The follower is placed in position with the excluder side downward and pressure is applied with the jack until the free end of the beam is lifted to its upper limit.

No further attention is required, as the weights attached to the free end of the beam exert continual pressure. An hour is sufficient for the separation of the honey from the wax and at the end of this period the wax can be removed from the basket. It may be more convenient to use two smaller baskets than one large one, but this is not important, provided the work of uncapping is not hindered.

The pressure exerted in the press is governed by the length of the beam and the amount of weight suspended from the free end. For satisfactory separation it has been found that a total pressure of from 3 to 5 tons is required.

Developing Wairarapa Hill Country

By W. V. HADFIELD, formerly Instructor in Agriculture, Department of Agriculture, Masterton

TODAY the average hill pasture of the Wairarapa coast is carrying about 1 sheep to the acre. Most of these hill pastures consist of danthonia with a varying survival of cocksfoot, a little ryegrass, with annual or native white clovers coming in with topdressing. Leading farmers and agricultural experts consider that most of these hill pastures could carry 2½ sheep to the acre if put into ryegrass-clover pastures. That this opinion is no idle dream is proved on three well-known, widely scattered properties where today 2½ sheep are being carried successfully in good condition and with sufficient cattle to maintain first-class pasture management.

Giant discs on steep country.

IMPROVEMENT on these three properties has been achieved by use of the giant discs. The properties are Winiata, the Alfredton property of Mr. R. W. Kebbell, Manawa, the Tinui property of Mr. W. E. Dalziell, and Otaraia, the Martinborough property of Mr. W. H. Martin, whose manager, Mr. W. J. Busch, has kept full records of costs for more than 10 years. It should be emphasised that these farmers are developing comparatively steep hill country not usually disced in the past, ranging up to 2000ft. in altitude and with disced slopes up to an angle of 45 degrees.

Though the detail of method and of seed mixture has varied slightly, the over-all costs and the resultant returns are similar. The average cost of development has been about £16 per acre, and the return, capitalising the net return per sheep at current prices at 4 per cent., about £20. However, as much of the developed country was covered with gorse and scrub, its farming value before development was practically nil. Some of these improved pastures have been down for more than 12 years now, and there is every reason to believe that the 2½ sheep carrying capacity can be maintained permanently provided sufficient cattle are carried and regular topdressing is continued.

Another factor is of even more economic significance. Country carrying 1 sheep per acre generally will not return sufficient revenue per acre to allow regular manuring by topdressing. Consequently it is farmed under a condition of constantly diminishing fertility, which must also mean decreasing value.

On the other hand, country on which 2½ sheep per acre are carried returns sufficient revenue per acre to allow regular topdressing, and the stock carried, including the heavy cattle stocking required, is sufficient for considerable manuring from stock excreta. It is farmed therefore under conditions

Left—Block on Winiata property ready for sowing. Right—Improved pastures on Winiata now capable of carrying 3 ewes per acre.

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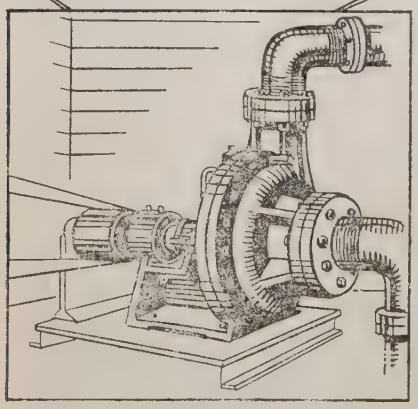

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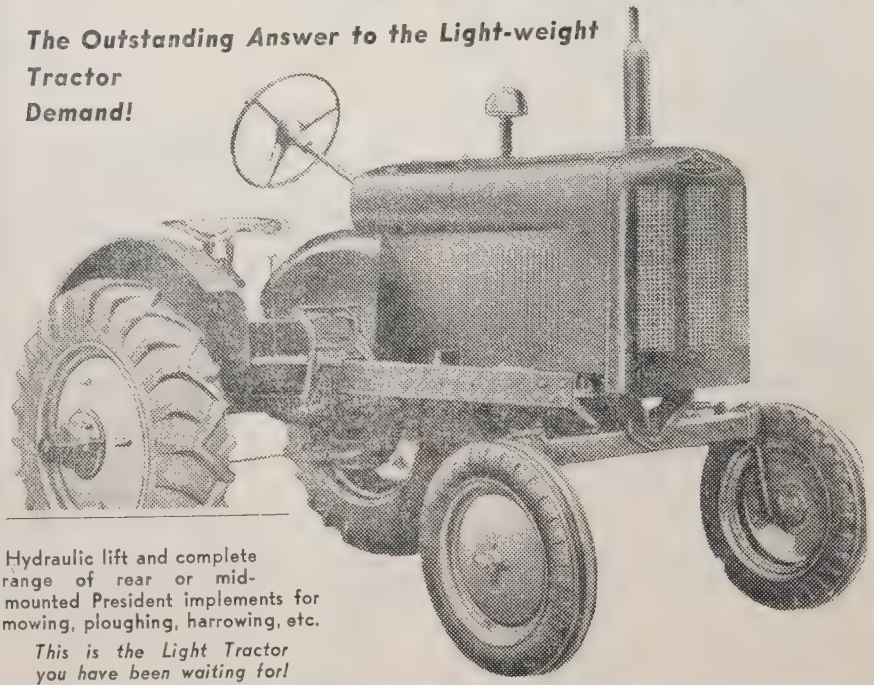

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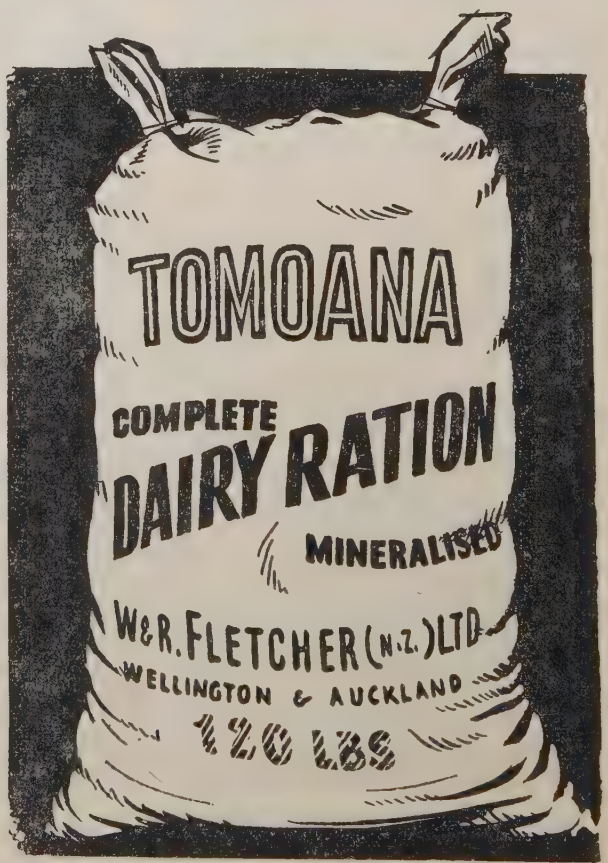

of increasing fertility and its value to the farmer should be constantly building up.

METHODS OF DEVELOPMENT

Winiata

Winiata, Mr. Kebbell's property, situated 12 miles north of Alfredton, is in the 45in. to 60in. rainfall belt and the soil consists of a fine sandy loam over sandstone. Pastures consisting of browntop, danthonia, and flat weeds carry in the unimproved state ¾ ewe per acre. If scrub cutting is not done this class of country reverts rapidly to manuka. In 1943 a start was made to bring some of this land into fuller production by giant discing it and sowing it down into a feed crop to be followed by grass and clover seed. Since 1943 an area of 350 acres has been so treated and today approximately 2 ewes per acre (the equivalent of 2½ sheep) are carried on this improved pasture. Most of the land has been brought into production through cropping, and herein lies the main difference in management from the other two properties. Partly as a result of a more fertile soil and a more generous distribution of rain, satisfactory crops of swedes and chou moellier have been obtained.

Heavy manuka scrub on the Manawa property. Improved pasture is shown in the background.

Seed-bed Preparation

Giant discing is done in autumn; a fair cut is applied to the discs and the area is double disced. Four to 6 weeks later the scrub is fired and the cultivated soil left to fallow until spring, when it is again disced both with giant and tandem discs. After one or two strokes with the giant chain harrows the seed-bed is ready for sowing into the first crop. Approximately 2lb. of chou moellier seed and ½lb. of swede seed are drilled with 3 to 4cwt. of serpentine superphosphate per acre. In most cases this is followed by a second crop the preparation for which consists of a discing with the tandem discs and a stroke of the giant harrows. In the third year the soil is similarly prepared, this time for grass seed. By now the original turf has completely rotted away and the heavy concentration of stock droppings has left the soil in good heart and suitable for supporting a high-quality pasture. The type of seed mixture favoured is:—

	lb.
Certified perennial ryegrass ..	15
Certified short-rotation ryegrass .	10
Cocksfoot	8
Crested dogstail	3
Certified white clover	2
Subterranean clover { Tallarook	1
Subterranean clover { Mt. Barker ..	1
Lotus major	1
Total	41

Permanent pasture is sown both in spring and autumn. As Mr. Kebbell has had up to 120 acres of land under cultivation in a year, it has been necessary to sow a proportion of the new pasture land in spring. The relatively short period available for autumn sowing has also necessitated this action. This practice has proved quite satisfactory under the higher summer rainfall of the district. Two to 3cwt. of serpentine superphosphate per acre is sown with the grass seed.

Grazing Management

Careful grazing management has been found necessary in the first few years. Only light grazing is permitted in the first winter and numbers are increased as growth comes away in the spring. As an example, the first 100 acres to be sown down carried 100 cull hoggets in the first winter and this was increased to 500 to 600 wethers in the following spring. Before it was improved, this particular block carried only 70 wethers, which Mr. Kebbell claims "were wintered badly". Today the same block carries 300 ewes, which come through the winter in excellent condition. No further second growth problems have occurred on these improved pastures. The dense pasture and high stock numbers have kept second growth well in check.

Improved pasture on Manawa carrying young station cattle.

PREPARING STEEP HILL COUNTRY IN THE WAIRARAPA FOR SOWING TO PASTURE

Stages in the development of hill country by the use of heavy implements. Upper right—Giant discs performing the first cut. Middle left—The final discing. Middle right—Seed-bed ready for sowing. Lower left—General view of the block before it was sown. Lower right—Giant chain harrows.

Regular topdressings, further subdivision, and drainage work have been found necessary as a follow-up of this improvement work. In the first 2 or 3 years applications of 2 to 3cwt. of superphosphate have been necessary, with subsequent topdressings at 2-year periods. Regular liming has been found difficult because of high cartage costs, but it is recognised to be necessary. On the easier slopes it was found that a great deal more absorption of water had taken place where the land had been cultivated. This called for some mole and tile draining, which has been effected where necessary.

Manawa

Manawa, Mr. Dalziell's property, situated 9 miles from Tinui, comprises 3200 acres, much of which is third-class hill country which reverts readily to manuka scrub and hard fern. The soil is a sandy loam on sandstone carrying a thin pasture of danthonia and browntop. Improvement work carried out by Mr. Dalziell was based on the cultivation technique adopted by Mr. Busch at Otaraia. A start was made in 1939 on a block of poor, windswept country 1100ft. above sea level which was carrying only a few wethers and run cattle. Since 1939 an area of approximately 170 acres has been brought into high-producing pastures carrying 2 ewes or 2½ sheep per acre.

Breaking In

The method of breaking in this country has varied a little. Of the first 75 acres, which were giant disced in the autumn of 1939, 60 acres were sown in swedes in the spring of 1939 and 15 acres sown in grass in the autumn of 1940. A very poor crop of swedes resulted, but the new grass germinated well and made excellent progress. Swedes sown on a 45-acre block the following year gave similar results and convinced Mr. Dalziell that it was not an economic practice to bring in grassland by cropping this class of country.

The standard cultivation method now is to giant disc in summer to a depth of 4in. or 5in., allowing plenty of cut on the discs. The block is then fallowed until the following January, when the giant chain harrows are used to break down and level the soil. This is followed by another giant discing and harrowing and, where possible, the area is rolled. Seed is broadcast through a drill, though it is intended in future to use a seed box attached to the front of the roller. Where scrub is heavy (and much of it is 5 to 6ft. high) the first discing aims merely to break down the scrub, which is then fired the following summer. The next operation is another giant discing, which is really the first effective cultivation. Then follows a harrowing and a further discing and harrowing before the seed is sown. Mr. Dalziell has noticed that the strike and initial establishment of grass sown are much better where 12 months' fallow is assured. As far as possible all cultivation work is done on contour lines to avoid the loss of topsoil by erosion. For this work a track-laying tractor is used for operating the giant discs and giant chain harrows. The following seed mixtures have been sown down on this country:—

Tractor operating on steep country at Otaraia.

	lb.
Certified perennial ryegrass	20
Cocksfoot	6
Crested dogstail	4
Subterranean clover (Mt. Barker)	2½
Subterranean clover (Tallarook)	1½
Certified white clover	2
Total	36

Later seed mixtures have been as follows:—

	lb.
Certified perennial ryegrass	25
Cocksfoot	6
Crested dogstail	4
Subterranean clover (Mt. Barker)	3
Subterranean clover (Tallarook)	1
Certified white clover	2½
Total	41½

These giant discs are heavily weighted to give a deep cut.

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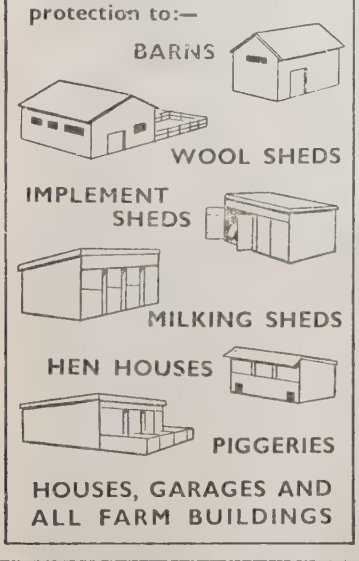

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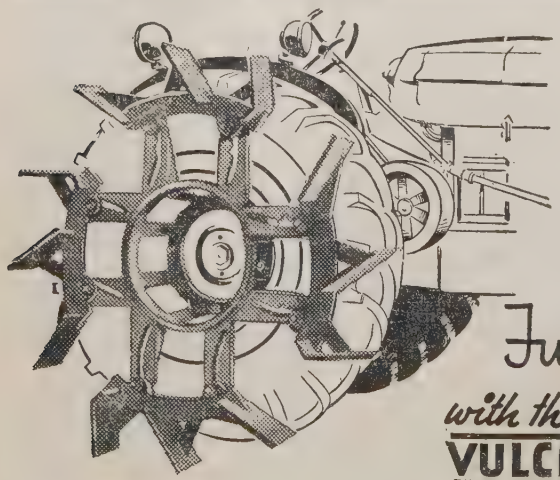

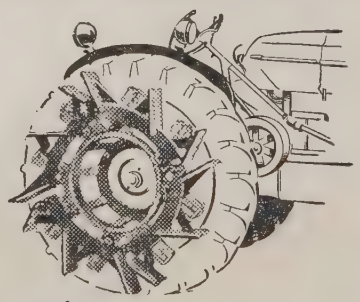

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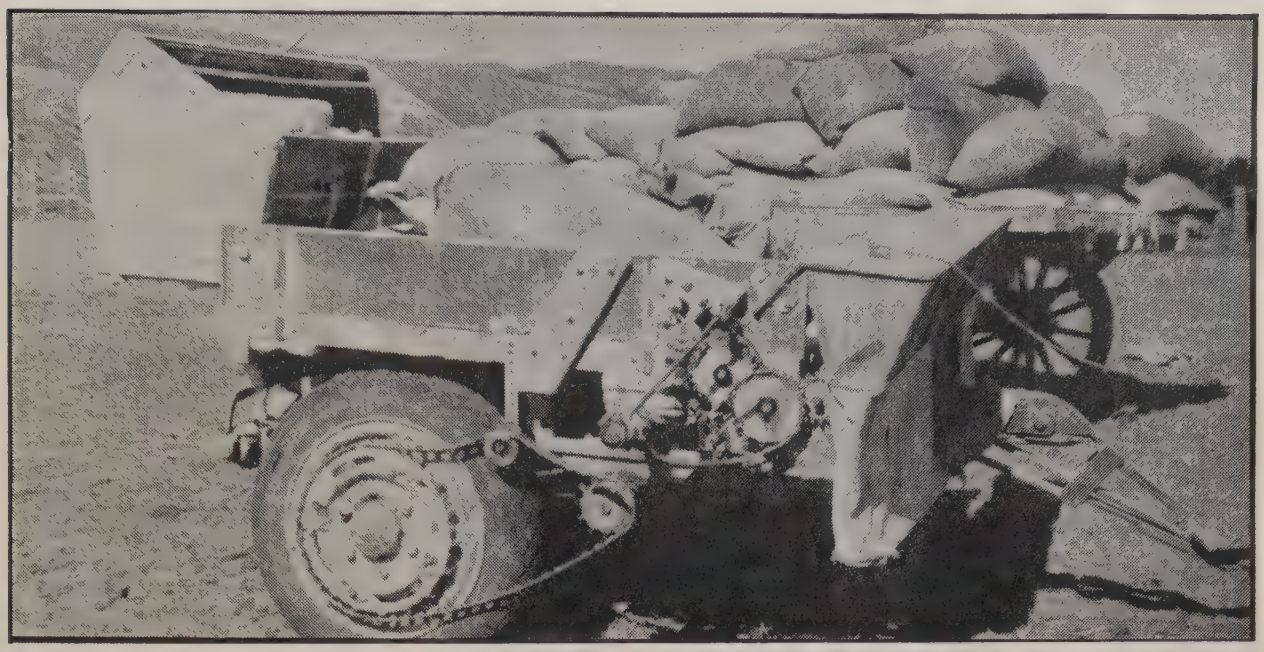

A manure trailer-distributor used on Otaraia. The seed box is attached to the front.

In some mixtures the perennial ryegrass has been reduced to 20lb. and 4 to 5lb. of short-rotation ryegrass added to the mixture. Superphosphate at 3cwt. per acre is sown through the drill with the seed and a further 3cwt. is applied in the second year. The rate of application is then lowered to topdressings of 2cwt. per acre every second year. In 1948, 75 acres were limed at 1 ton per acre for the first time, and in 1949, 45 acres were limed at 5cwt. per acre. Liming is considered most desirable on this country, but high cartage costs have made it difficult in the past.

Additional fencing and the building of dams for water supply have been necessary on the blocks of land which have been sown down into improved pasture. Although grazing control is practised to some extent on these paddocks, the fact that the locality is somewhat removed from the better class of land on the property has made it impossible to follow a standard rotation of grazing. Approximately 500 hoggets and station cattle are wintered on this 170 acres of the farm. No second growth has made its appearance.

Otaraia

Mr. W. J. Busch, who is managing the McRae Martin Trust property, Otaraia, 8 miles from Martinborough, has had considerable experience of hill-country cultivation work. It was here that giant discing of hill soils was first carried out by Mr. W. H. Martin, who pioneered this class of work in the Wairarapa. The predominant soil type on this property is a light silt loam derived from greywacke. Much of this country has reverted to dense manuka scrub, with heather, fern, and lycopodium competing with the existing sward of danthonia, browntop, and sweet vernal. The giant discs have brought into high-producing pastures considerable areas of this property, and it has been done economically.

Discing of Standing Scrub

A start is made by double discing the standing scrub when the soil is at its driest, preferably in February, when the hard surface assists in securing a clean cut. Extra weight in the form of a concrete strainer post is used on the implement, which is drawn by a track-laying tractor. The first cut aims at breaking down the scrub preparatory to a burn. For this reason only a little cut is applied to the discs to avoid burying the scrub, which would not then carry a fire satisfactorily. The tractor tracks also help in breaking down the scrub and the weighted discs tend to shear off the manuka just below ground level. Much skill is required of the operator in negotiating steep sidlings, hummocks, and wash-outs, which are difficult to see when operating in thick scrub 5 to 6ft. high. For this reason the first cut is the most hazardous. Where possible, hummocks have to be chopped down and levelled off and wash-outs filled in with the discs in preparation for succeeding cuts. To ensure a good burn the cut scrub is burnt off about 6 weeks later while there is still plenty of leaf present to carry a good fire. If scrub is not present in sufficient quantity to carry a fire, the giant harrows are used after the first cut to roll the scrub into heaps which are later burned. Although the object of the first cut is primarily to chop down the scrub, the soil is sufficiently disturbed for the operation to be classed as a preliminary cultivation.

Long Fallow Recommended

Mr. Busch emphasises the necessity for a long fallow period before the area is sown down. Consequently, nothing further is done until the following January or February, by which time the turf has partially decayed and the soil is easy to cultivate. A second discing is the next operation. A good cut is put on the discs, which cultivate the soil to a depth of 6in. to 8in. This is followed by a stroke with the giant chain harrows. This breaks down the larger lumps and helps to consolidate the soil. A heavy railway iron at the back of the harrows assists in levelling the surface, which, although loose and rubbly, is sufficiently consolidated to ensure a good strike of grass seed. A rolling of the surface would probably benefit the seed-bed, but on much of the country it is impossible to operate a roller. Mid-March is the most suitable time for sowing grass seed, which is broadcast with manure through the drill. In selecting a suitable mixture emphasis is laid on an ample supply of clover seed. The following seed mixture has given excellent results on this property:—

	lb.
Certified perennial ryegrass ..	26
Crested dogstail	2
Certified cocksfoot	2
Certified white clover	4
Subterranean clover	4
Total	38

Although the seeding rate of cocksfoot is light, judicious grazing management has enabled this grass to persist in all pastures, and it offers valuable grazing during the dry summer. Three hundredweight of superphosphate and 1 ton of lime per acre are broadcast

Close-up of seed-bed on area at Otaraia.

through a rotary topdresser mounted on a low-wheeled 7ft.-square platform trailer. This is fitted with a hopper capable of holding ¼ ton of fertiliser. With this machine a 24ft. spread of fertiliser is obtained. A lime supply is close to the property and lime is secured in bulk for distribution. Annual topdressings of superphosphate are not stinted for the first 2 or 3 years, as it is considered that this is a vital stage in successful pasture establishment.

Grazing with Large Mob

The need for careful grazing management in the first year is emphasised. Once the pasture has established itself a large mob of ewes is put on the block to graze the pasture quickly and evenly. This has to be done before the wet weather sets in. Its advantage is that the ground is consolidated and plants are able to stool out after the grazing. Only light grazing is then permitted until the following spring, when pasture growth is able to support a greater concentration of stock.

Under this scheme of development land that was carrying only a few dry ewes on 500 acres is now carrying 2½ sheep per acre. Difficulty was experienced in getting the clovers to take on the hill and ridge tops, and in the absence of clovers the ryegrass soon deteriorated. Mr. Busch has overcome this by fencing his paddocks so that as far as possible the only flat land in the paddock is on the hill top or ridge, and here water dams have been constructed. Stock grazing on the slopes have in their quest for water carried the fertility up to the exposed hill tops and the concentration of excreta there has brought in the clovers and enabled the successful maintenance of ryegrass. Today, several years after the first sowings, the ryegrass is in good heart, and for part of the period topdressing had to be discontinued because of the war.

Siting of Fences and Dams

Mr. Busch places great emphasis on the correct siting of fences and dams. As an illustration of the bad effects of a wrongly placed fence he cites one part of Otaraia where the ryegrass is looking much less thriving than on the rest of the property. The particular area is flat valley floor with much better soil and more moisture than the hills, but today its pasture is poorer. The reason is that it is fenced in with a block of hill country and the sheep hang on the flat, thereby overgrazing it. The fence is in the wrong place, and Mr. Busch stresses that hill pastures will be improved greatly if low-lying flat land can be excluded by fencing.

The siting of dams is also considered important. Not too large a catchment area is favoured and gullies are avoided except in their very tops. It is surprising how small a catchment area will fill a dam. Mr. Busch tries to place his dams so that the prevailing wind will lap the water away from the stopbank and not toward it, as the lapping of the water against the stopbank causes scouring and the possible destruction of the dam. Where possible, pipes are led from the dams so that one dam serves several paddocks.

Cost of Development

The total cost of development has been £16 10s. per acre, made up as follows:—

	£	s.	d.
Cultivation	2	2	9
Manuring	5	13	0
Seeds	3	9	9
Fencing	4	3	0
*Miscellaneous	1	1	6
	£16	10	0

* Includes depreciation and running costs of truck carrying supplies, extra labour for topdressing, and insurance.

The acreage of the various operations done per day averages as follows:—

	Acres per day
First-cut discing	4
Second-cut discing	6
Giant harrowing	14
Sowing and spreading	8

METEOROLOGICAL RECORDS FOR APRIL

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	58.8	— 1.2	76.5	36.0	5.03	18		1.33	20	173.8
Auckland	160	62.5	+ 1.3	77.0	47.9	5.89	19	+ 2.05	1.08	27	169.5
Tauranga	10	59.6	+ 1.2	73.8	41.2	3.78	19	— 0.94	0.62	22	178.3
Ruakura	131	57.6	+ 1.0	75.2	30.1	4.52	23	+ 0.80	0.89	22	157.9
Rotorua	969	56.6	+ 1.5	75.5	37.1	3.33	19	— 1.18	0.70	3	139.2
Gisborne	12	58.6	— 0.2	76.2	37.5	3.46	16	+ 0.03	1.13	4	154.9
New Plymouth	160	59.1	+ 0.4	70.8	44.8	5.70	18	+ 1.04	1.31	7	179.2
Napier	5	59.0	+ 0.4	77.3	40.7	4.10	15	+ 1.49	1.37	10	153.0
Karioi	2125	51.6	+ 1.4	69.5	31.5	4.62	16	+ 0.91	1.00	25	
Wanganui	72	58.7	+ 0.9	78.0	41.0	4.10	18	+ 0.86	0.78	7	175.9
Palmerston North	110	57.8	+ 1.0	75.0	37.5	5.16	17	+ 1.79	1.62	19	148.1
Waingawa	350	55.9	+ 2.0	76.0	34.0	4.97	21	+ 2.06	1.69	19	118.9
Wellington	415	56.6	+ 0.9	70.6	42.1	3.63	18	+ 0.09	1.12	7	141.7
Nelson	24	56.8	+ 0.4	71.0	34.8	4.93	19	+ 1.89	1.39	1	169.3
Blenheim	12	56.1	+ 0.0	74.7	31.8	2.24	11	+ 0.46	0.81	17	187.5
Hokitika	12	54.4	+ 1.2	71.0	33.1	10.69	17	+ 1.30	1.62	8	142.1
Hanmer Springs	1225	50.6	+ 1.4	71.2	27.2	7.04	17	+ 3.71	1.62	18	95.2
Christchurch	22	54.0	+ 0.5	71.8	30.2	8.03	16	+ 6.19	2.56	1	96.8
Ashburton	323	52.9	+ 0.5	74.8	32.4	4.20	12	+ 1.90	1.20	17	108.9
Timaru	56	53.9	+ 0.7	74.5	32.4	3.13	8	+ 1.52	1.33	1	95.6
Alexandra	520	51.3	— 0.2	74.2	28.7	2.12	13	+ 0.59	0.68	25	121.0
Taieri	80	52.0	+ 0.7	72.8	33.5	3.27	13	+ 0.98	1.25	26	112.5
Invercargill	32	52.4	+ 1.9	74.0	28.0	2.60	15	+ 1.46	0.60	25	119.0

Cover Crops and Mulching in the Home Orchard

EVERY year among the problems facing the home orchardist is that of how to maintain the humus content of the soil. That can be accomplished in one of three ways—by growing a green cover crop, by working in compost or manure, or by mulching. Plants suitable for green cropping and the use of mulching material are discussed in this article by H. A. Prew, Orchard Instructor, Department of Agriculture, Auckland.

[*Sparrow Industrial Pictures Ltd. photo.*

This fine crop of lupins shows the bulk of material supplied by these plants.

THE importance of maintaining organic material (humus) in the soil has been stressed frequently in the "Journal" and other publications, but questions are often asked about the kinds of cover crops to use, the value of mulching the surface of the soil around fruit trees, and the usefulness of prepared garden composts.

Broadly, the advantages of adding organic material to garden soils, as green crop, mulch, or compost, or in any other form, include:—

An over-all improvement in soil condition, leading to easier cultivation, increased water-holding capacity, and freer drainage of excess soil water.

Provision of a suitable environment for beneficial soil micro-organisms, as well as earthworms.

Improvement in soil fertility by the returning to the soil of some of the plant food taken away by the removal of crops, or lost by such causes as leaching and soil erosion.

The best way to maintain the humus content of the soil at a satisfactory level depends on circumstances such as climate and the kind and quantity of materials available for the purpose. The animal and vegetable matter from which humus is derived is of little immediate use to plants in its fresh state; in fact, it may even be harmful if added to the soil in large quantities in that condition. To be of real value all animal and vegetable matter must first go through a process of decomposition.

The best way to add humus to the soil in a condition in which it is readily available to plants is by working in quantities of prepared, decomposed materials such as compost or well-rotted animal manure. Unfortunately, large supplies of such materials are not always available. Many home gardeners are not in a position to make compost in sufficient quantities on their own properties or to obtain supplies of manures.

For these reasons alternatives have been sought, and the growing of cover crops of certain plants and digging them in has been encouraged.

Cover Crops

Leguminous plants such as blue lupins, vetches, partridge peas, tick beans, broad beans, and Dunn peas are desirable cover crops because, in addition to providing large quantities of bulky organic material, they also add

A well-grown crop of partridge peas 2 months after being planted.

nitrogen to the soil through nodules which develop on their roots. The illustrations on the preceding page show the bulk of material available from lupins and partridge peas.

The New Zealand blue lupin (*Lupinus angustifolius*) is the most popular for a cover crop. It has been used for many years to improve the gumlands around Auckland. An annual crop, it can withstand quite severe frost until the flowering stage, when it is more susceptible. For best results it should be dug in at the flowering stage.

Lupin seed should be sown at the rate of 1 to 2oz. (a small handful) to 3 sq. yds. Broadcasting the seed and raking it in should be satisfactory in the home orchard.

Though relatively free from disease, lupins sometimes become infected with a virus disease called "sore shin". This disease was described by J. C. Neill, R. M. Brien, and E. E. Chamberlain in "The Journal of Agriculture" for September, 1934, as follows:—

The first visible symptoms of the disease are a slight stunting of the plant, associated with the characteristic curling of the growing point to one side. Simultaneously a light-brown streak appears on that side, extending the whole length of the stem. Growth ceases with the appearance of the first symptoms of the disease. On cutting, the vascular system of infected plants shows a brown discoloration, which is more extensive in the roots and growing points than on the main stem. The discoloured area subsequently extends until the whole stem becomes brown. The young leaves at first wilt and then turn black, while the older ones become tinged with purple, turn yellow, and ultimately fall. The stem turns black, the roots decay, and finally the plant dies. Infection takes place at all stages of growth, being observed in seedlings 4in. tall and mature seeding plants.

Land is said to be "lupin sick" when diseases have built up to such an extent that the plants no longer thrive. This can be avoided by rotating cover crops, using lupins alternately with other suitable plants.

Vetches, partridge peas, Dunn peas, tick beans, and broad beans have many of the good qualities of lupins and are well worth a trial, though usually they do not produce quite the same bulk of material.

Non-leguminous plants commonly used as cover crops are oats, rye, barley, and wheat, which are hardy and frost resistant and can be grown almost anywhere, and mustard, which can be grown in all districts but does better in warmer areas. Oats, barley, wheat, and rye can be sown at the rate of a small handful (about 1oz.) per square yard and mustard at about ¼oz. per square yard.

To allow green crops to decompose and form compounds assimilable by the plants they should be dug in as early as possible in spring, so that they are broken down before the fruit trees or garden plants begin to make heavy demands on soil nutrients. If large quantities of fresh organic materials are dug into the soil (for example, when a green crop is dug in in spring), planting of vegetables or sowing of seed should be delayed until decomposition of this material is well advanced. When the soil is cold or very dry the breaking down of organic material proceeds very slowly, or may even cease until conditions improve.

For the first year of green cropping increased applications of nitrogenous manures are often necessary because of the absence of readily oxidisable nitrogenous organic matter, but after the first year fertiliser applications may be reduced because the fertilisers applied do not leach out to the same extent as they do under clean cultivation. The gradual build-up of humus materially increases fertility and so lessens the need for fertilisers.

Mulching

Surface mulching of the soil around fruit trees has much to commend it in hot weather. Such materials as lawn clippings and straw, or even light hedge clippings, used from late spring to early autumn help to conserve moisture, and experiments have shown that a good mulch applied year after year results in an improvement in the condition of trees and in the size and colour of fruits. Addition of organic material to the soil encourages earthworms, which in turn contribute toward effective soil drainage and general improvement.

The roots of citrus trees tend to rise into the mulch as it decays, so cultivation around citrus trees in autumn should be light—no more than 2 to 3in. deep.

Mulching material must be worked into the soil in autumn. If it is allowed to stay on the surface during winter and early spring, it keeps the ground too wet and cold, thus delaying the growth of trees in spring and encouraging development of fungal trouble such as root rot (*Rosellinia radiciperda*).

Material should never be piled up round the trunks of trees, as this fosters attacks by diseases and pests, such as collar rot and woodlice (slaters). Woodlice (*Oniscus*) cause quite a lot of trouble around the crowns of plants, often killing young passion fruit vines.

Plastic Tubing for Skimmed Milk Disposal

FOR some time dairy farmers have had difficulty in obtaining supplies of galvanised-iron piping for conveying skimmed milk from farm dairies, and many inquiries have been received concerning substitutes for temporary use during shortages of galvanised-iron piping. Consideration was given to materials which might be used in emergencies and a trial of plastic tubing was conducted on a farm near Hamilton. Results suggest that it will prove satisfactory.

Approximately 300ft. of ½in. P.V.C. (poly vinyl chloride) plastic tubing (ordinary plastic garden hose) was connected between the skimmed milk pump and piggery. The separator was of 75 gallons capacity. One portion of the total length of tubing was buried underground in a comparatively damp area while a further section was left exposed. By this means some information was gained as to whether the material would deteriorate from exposure to sunshine and the action of acidity and whether it would be affected by being placed underground.

The trial began on February 28, 1950, and short portions were cut from the length in different positions and examined on March 29, 1951. The period of the trial, therefore, included both winter and summer. The tubing was not dismantled or cleaned during the trial and was merely flushed with cold water following twice-daily use.

The examination showed the whole line to be in very good condition. There was no evidence of deterioration of the inside surface from the action of acidity, nor was there any apparent effect on the outside of the tubing from exposure to the elements. The portion buried underground was also in good condition and showed no deterioration apart from some staining or change in colour of the outside surface.

The results of the trial are most promising and suggest that this type of tubing will prove satisfactory at least as a temporary substitute for galvanised-iron piping.

It is impossible to estimate accurately the efficient life of plastic material used for delivering skimmed milk, but the trial suggests that plastic tubing is likely to be satisfactory for several years. The flexibility of the tubing is also probably an advantage on many farms.

Acknowledgment

The assistance of Mr. R. V. Green, of Hukunui Road, Hamilton, who made his farm and dairy available for the trial and who carried out the routine procedure, is acknowledged.

—W. G. BATT, Supervisor of Farm Dairy Instruction,
Department of Agriculture, Hamilton

Hamilton Radio Broadcasts

RADIO talks will be given to farmers from Station 1XH Hamilton at 12.33 p.m. as follows:—

July 5—"The Milking Shed", by G. Purvis, Superintendent of Butter Instruction, Department of Agriculture, Hamilton.

July 12—"Mineral Nutrition of Plants", by K. J. McNaught, Agricultural Chemist, Soil Fertility Station, Rukuhia.

July 19—"Early-spring Work in the Home Orchard", by C. E. K. Fuller, Orchard Instructor, Department of Agriculture, Hamilton.

July 26—"Wool and the Needs of the Nation", by L. Wilson, Federated Farmers, Hamilton.

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Management of Pigs from Weaning to Slaughter

THE foundations on which efficient production of high-quality porkers and baconers is built are healthy, heavyweight weaners, but lack of care and attention from this stage can ruin the result of good work put into litter production. Well-done litters deserve good treatment after weaning. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with some points in the management of pigs between weaning and slaughter weights.

THE encouragement being given to the production of porkers by the present schedule of prices really diminishes the farmer's problems. During the past few years, when emphasis was on the production of baconers, the farmer was hard put to bring all his pigs up to bacon weight without using considerable quantities of high-priced and scarce supplementary feeds. However, now that the price being paid for porkers makes them really profitable, pigs, and particularly summer litters, can be put off at lighter weights and much better use made of skimmed milk or whey.

Farrowing Dates

To take full advantage of this situation the first necessity is to try to arrange the farrowing dates of sows to fit in with the feed supply. On most dairy farms where the cows calve in July-August farrowings in May-June and November-December have been found most suitable. Early-May farrowings make the wintering of store pigs unnecessary, for these early litters are big enough to deal with all the skimmed milk available when most of the cows have calved by the middle of August, especially as on all dairy farms calves are being reared at that time of year and they are consuming a considerable quantity of skimmed milk. This in itself is an advantage, as the cost of wintering a litter of pigs that are still being suckled by the sow is considerably less than the cost of wintering the same number of store pigs.

These early litters grow as the feed supply increases and consequently can easily be taken up to baconer weights, which they should reach during November and December. As the sows will farrow again in November, the number of pigs on the farm is greatest just when the supply of dairy by-products is at its height.

From the end of December onward milk production decreases and so does the quantity of food available for the pigs. This decrease is gradual for some 2 months and then becomes fairly rapid. Disposing of the November litters a few at a time as soon as they reach properly finished pork weights — from 60 to 80lb. carcass weight—gradually reduces the number of pigs on hand as the feed supply drops. The first few pigs from the early-November litters should be ready for the works in February, and from then on pigs can be sent away at regular intervals and the number on hand reduced to keep pace with the falling milk supply.

Pigs 10 weeks old still in the farrowing quarters. Litters should remain in the farrowing quarters for at least a fortnight after being weaned so as not to increase the shock caused by the departure of the sow.

Attention after Weaning

Whether May litters are being taken to bacon weight or November litters to pork weight, careful attention after they have been weaned is equally necessary.

Conditions on the farm should allow a litter of pigs to be kept in its farrowing quarters for at least a fortnight after it has been weaned and the sow has been taken away. The departure of the sow is a considerable shock to the piglets, and if at the same time they are taken out of the quarters to which they are accustomed and mixed up with strange pigs, possibly bigger and stronger than they are, the shock is much greater.

During the past few years dairy farmers have heard much about the psychology of the milking cow, and many of them have applied what they have heard, considerably to their own profit. The pig is just as resentful as the cow of sudden changes in conditions and diet, and their effect is just as detrimental to the pig producer's profit. The smoother and gentler these changes are, the evener and more rapid is the growth of the pigs.

Unless steps are taken to prevent it, a sudden change in the quality of the pigs' diet occurs at weaning because the sow's milk is no longer available. This milk is high in fat content, whereas skimmed milk or whey has virtually no fat left in it. The use of small amounts of tallow at this stage is a great help, and feeding it in the creep should start 7 to 10 days before the piglets are weaned. At first the quantity fed should be only about a teaspoonful (1oz.) a day to each piglet, and this can be increased to 4oz. at weaning, continued for 6 weeks, and then gradually stopped. If it can be obtained, a teaspoonful of fish-liver oil each day is also extremely helpful, particularly for winter litters and young pigs which do not get much grazing. These foods are expensive, but the quantities used are very small, so the cost per pig is not high, and the result in keeping the bloom on the pigs and preventing their receiving a check at weaning more than justifies their use.

Maintaining Temperatures

Keeping pigs warm is very important, especially when they are first weaned. Pigs react unfavourably to changes in temperature and grow more quickly and use less food at an even temperature of 65 to 70 degrees F.— the higher temperature for younger pigs.

In most parts of New Zealand temperatures for by far the greater part of the year are below that desirable for pigs, and even during hot weather only for a few hours in the middle of the day does the temperature rise too high for them. The range of temperatures during hot weather is very considerable, perhaps from 90 degrees between 2 and 3 p.m. down to 50 degrees between 2 and 3 a.m.

Therefore houses should be built to give as much control as possible over the temperature in them, mainly with a view to keeping the pigs warm and free from draughts. On the comparatively rare occasion when they require cooling a spray of water playing on the concrete floor in front of the sleeping quarters is the most effective method; water evaporating from the floor lowers the temperature.

Sleeping quarters must be kept dry and this presents some difficulty in the housing of young pigs that have been weaned recently. They need some training in keeping their sleeping quarters dry and clean. One method of doing this is to reduce the area of the sleeping floor to half its size with a temporary wooden floor raised at the back on blocks to give it rather more slope than usual and with a piece of 3in. x 2in. timber fixed along the front edge to prevent bedding being pushed off it. After 2 or 3 weeks this temporary floor can be removed.

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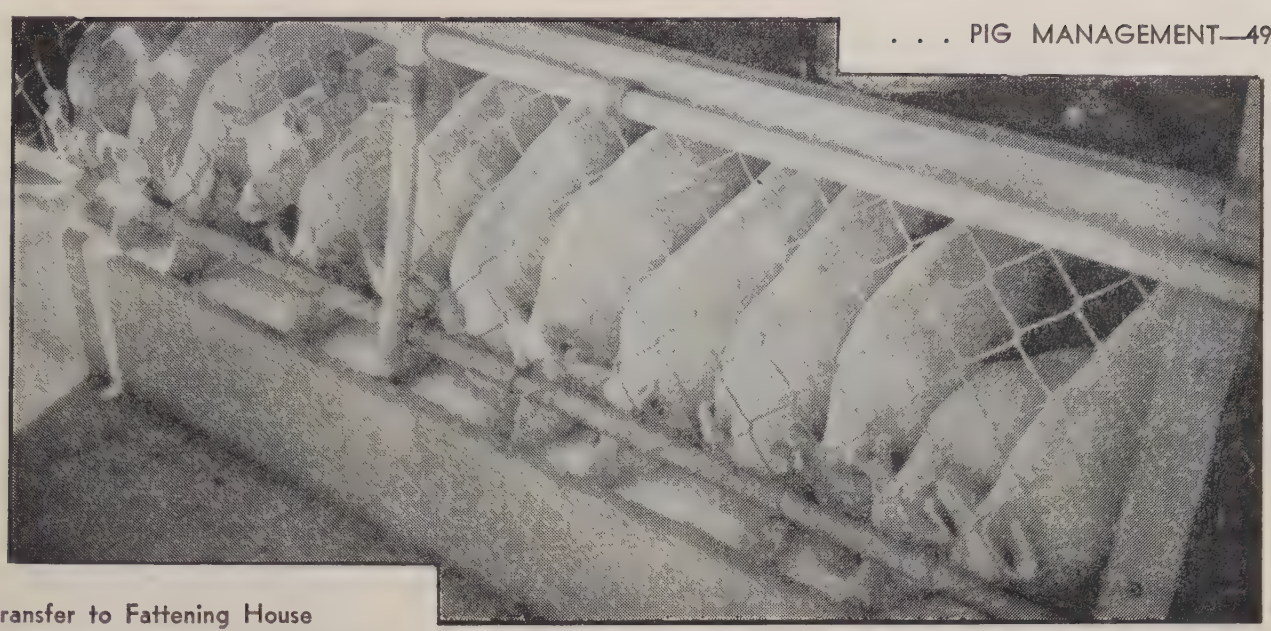

Porkers in a fattening house. If the pigs are disposed of a few at a time as they reach porker weights, the number on hand can be made to keep pace with the decline in the supply of dairy by-products.

Transfer to Fattening House

Pigs can be transferred to a fattening house 2 to 4 weeks after they have been weaned, according to how soon the farrowing house is required for another sow, though time must be allowed for a thorough cleaning of the farrowing house. When put into the fattening house pigs should be graded into groups according to size. If the house has a dunging race, pigs should be shut into it for the first 2 to 3 hours to train them in its use. A water trough with a constant supply of clean drinking water should be installed in each unit of the fattening house, and there should be easy access to a good grass paddock so that the pigs can be let out on to grass two or three times a week at least.

Feeding up to 4 Months of Age

Plenty of good food is necessary up to the age of 4 months to keep the pigs growing as fast as possible, because during this time the pig makes lean meat, of which the greatest possible quantity is required in the finished carcass. For litters farrowed in May less skimmed milk is available during the first 4 months than for litters farrowed in November. In the table below, which can be used as a guide to the amount of food to be given, separate rations are given for May and November litters.

Variation in type often occurs in a litter, some of the pigs showing signs of maturing earlier than others. When this is found in a litter farrowed in May, the more advanced pigs are better sent away as porkers, because they will not make first-class carcasses if taken on to bacon weight.

DAILY RATION FOR A PIG FROM 2 TO 4 MONTHS OLD

Age (weeks)	SPRING LITTERS (born in May)			AUTUMN LITTERS (born in November)		
	Skimmed milk (gallons)	Meal (lb.)	Greenfeed or roots (lb.)	Skimmed milk (gallons)	Meal (lb.)	Greenfeed or roots (lb.)
9	½	1	1	1	½	Grazing
10	1	1	1 to 2	1½	½	Grazing
11	1½	1	2 to 3	2	½	Grazing
12	1½	1	2 to 3	2½	½	Grazing
13	1½	1	2 to 4	3	½	Grazing
14	2	1	2 to 4	3½	½	Grazing
15	2½	1	2 to 5	3½	½	2
16	2½	1	2 to 5	3	½	4 to 8

DAILY RATION FOR A PIG BORN IN MAY FROM 4 MONTHS OLD TO BACON WEIGHT

Age (weeks)	Weight (lb.)	Daily weight increase (lb.)	Food units	Skimmed milk (gallons)	Meal (lb.)	Greenfeed or roots (lb.)
17	99	1.1	4.0	2½	1	3 to 6
18	107	1.1	4.2	2½	¾	5 to 10
19	116	1.2	4.4	2¾	¾	5 to 10
20	125	1.2	4.55	3	¾	5 to 10
21	134	1.25	4.8	3½	½	Grazing
22	143	1.3	5.0	4	½	Grazing
23	152	1.35	5.2	4½	—	Grazing
24	162	1.4	5.4	5	—	Grazing
25	173	1.5	5.7	5½	—	Grazing
26	183	1.5	6.0	5½	—	Grazing
27	193	1.5	6.25	5¾	—	Grazing
28	203	1.5	6.5	6	—	Grazing

Feeding after 4 Months of Age

After spring litters have passed 4 months of age they are usually faced with an abundance of food in the form of skimmed milk or whey. Dairy production increases rapidly with the spring growth of grass and calves are reaching weaning age, so releasing more milk for pigs. In these circumstances there is a danger of over-feeding, which must be guarded against if high-class baconer carcasses are to be produced. When food is in plenty it is very tempting to give it all to the pigs, which will certainly respond and consume a very large quantity, but it is far better to feed the pigs that are being taken to bacon weight a proper ration and to store any surplus in the form of curd for use in winter. That is not difficult, and full details of the process are given in Department of Agriculture Bulletin No. 289, "Curd for Feeding Pigs", available from any office of the Department of Agriculture. The table above gives a guide to the ration required by pigs from 4 months old to bacon weight.

A regular run-out on good pasture is essential to keep these pigs in good health, and they should be let out two or three times a week. When a regular ration such as that tabulated is fed, three feeds a day are quite satisfactory.

Benefit of Weighing Pigs

An important point of management during the later stages of baconer production is regular weighing of the pigs. A set of scales is a necessity for efficient production; it is not a very costly item and is one that soon pays for itself. A set of platform scales, which often can be obtained second hand, is the most accurate, but a 300lb. spring balance is quite effective and a weighing crate to use with it can easily be made on the farm.

The importance of not sending away pigs that are heavier than 160lb. carcass weight can be realised from a study of the present schedule of prices. For example:—

Carcass weight	Price per lb.	Value £ s. d.
155lb.	1s.	7 15 0
165lb.	10d.	6 17 6
181lb.	8d.	6 0 8

Baconers grazing in a paddock. Litters born in May require a regular run-out on good pasture as they are carried on to baconer weights.

Not many overweight pigs need be sent away for the loss to equal the cost of a set of scales.

November Litters

After the New Year, when all the spring litters have been sent away as baconers, the November litters are weaned and for the next 5 or 6 weeks have a plentiful supply of food in an average dairy season, because milk production does not drop very rapidly at first unless, as occasionally happens, drought conditions set in in January.

From the end of February, however, dairy production starts to drop fairly rapidly, but by that time the earliest of the November litters are between 60 and 80lb. carcass weight, and these should be sent away, the number of pigs on hand being reduced as the food supply falls. This policy is continued, a few pigs, perhaps only one or two, being sent away each week or fortnight as they are ready.

Home-grown Crops

The provision of home-grown crops can increase the supply of food available for the pigs and reduce the amount that must be bought in autumn. If barley has been grown, some of it can be used to advantage at this time of year.

Lucerne can be fed as greenfeed in the pens, or pigs that are running can be turned out to graze in the lucerne paddock for a short period each day. A pig's appetite for lucerne is 8 to 10lb. daily at the most. Some people say that pigs will not eat green lucerne, only making a mess of their pens with it, but that is because they are given far too much and, having eaten all they require, they make a mess with the rest.

Rape is another useful green crop that costs nothing to harvest, as the pigs can be turned out to graze on it.

Early pumpkins are also valuable; some of the earliest-maturing varieties are among the squashes, Hubbard's squash and Golden Warren being two of them. If a really early crop of them is obtained, a consignment can profitably be sent to the city markets and the rest used for the pigs.

Aim of Management

The aim of management in autumn should be to have all pigs except the breeding stock away to the works by the end of the dairy season. That can be accomplished by arranging the farrowing dates of sows to fit in with the supply of dairy by-products during the season and by ensuring that pigs are comfortably housed, well fed up to the age of 4 months and not overfed after that age, and sent away at the correct weights, whether as porkers or baconers.

Pigs should be taken to bacon weights during the first half of the dairy season, and porker production should be concentrated on during the second half, though right at the end a few pigs may be taken to bacon weights with the aid of home-grown supplementary food. The farmer who carries out this programme will find that, at present prices, his pigs are returning him a handsome profit.

A TRACTOR working on the flat is not likely to tip sideways, but on hills there is a real danger of that occurring. Track-laying tractors do not tip as readily as wheeled models because they have a lower centre of gravity and usually travel more slowly.

The factors affecting tipping are gravity, the grades being worked on, speed, centrifugal action, and loads pushing, pulling, or twisting on the drawbar. A stationary tractor is stable if the centre of gravity passes to the ground inside the lower wheels or tracks. Stability is disturbed by surface irregularities and tractor movement, and higher speeds mean greater danger.

The effect of gravity is downward, while centrifugal action pushes outward, especially in an uphill turn where the outer wheels or track run on a lower level, the resultant forces tending to roll the tractor over sideways, as is shown by the tracks of a tractor and trailer in the lower illustration.

An operator can best avoid tipping by:—

Throttling down when necessary, and especially to take corners or cross rabbit warrens or when grips are extended in sloping ground which contains rocks or stumps.

Changing to a lower gear to prevent implements taking charge.

Attempting to work only country on which he knows the tractor can operate in reasonable safety.

Taking extra care where surface irregularities occur.

Keeping well clear of cave-ins, riverbanks, and gullies.

Extending the wheels on the axles to the outer limits where possible.

—J. N. M. WHYTE, Farm Machinery Instructor, Department of Agriculture, Dunedin

Growing Lettuces Outdoors and under Glass

By S. O. GILLARD, Vegetable Instructor, Department of Agriculture, Auckland

LETTUCE is probably the most popular salad vegetable in New Zealand and is particularly welcomed in spring and early summer after a succession of winter vegetables. In the Auckland area where suitable climatic conditions prevail lettuces can be produced outdoors all the year round, although peak production is in early summer. Lettuce culture has become common among all commercial vegetable growers, because being a short-term crop lettuce is often a very convenient "filler" between two main crops of other vegetables.

LETTUCE (*Latusa sativa*) is a native of India and Central Asia and its present-day excellence is far removed from its original state. Although it is most easily grown in spring, good crops can be produced outdoors throughout the year in favourable localities around Auckland.

Possibly the most difficult period in which to grow firm-headed lettuce is late summer. Most firm-headed varieties require a relatively low summer temperature, particularly during the last period of growth. With high temperatures the tendency to "bolt" is greatly accentuated; bolting is the rapid elongation of the seed stem and causes the separation of the leaves and consequently only a loose head to form. If bolting begins at an early stage, it may prevent the formation of a hearted head.

Soil Conditions

Although lettuce has a high moisture requirement, it is intolerant of very high soil-moisture content. Soils selected for lettuce culture should be friable; it is important that they do not pack after rain nor crack in dry weather. Soils for winter culture should be sufficiently open textured to facilitate the rapid dispersal of winter rains. To be succulent, lettuce must be kept growing rapidly and a good rich loam is to be preferred to poor soils which require heavy dressings of fertiliser.

Lettuce is one of the most sensitive of vegetables to soil acidity, and many instances of crop failures can be traced to high acidity. A near-neutral but not alkaline soil is best and applications of lime may be necessary to correct acidity where it is considered to be excessive.

Varieties

Of the varieties of lettuce commonly grown in commercial gardens in Auckland the following are most popular:—

Neapolitan, also known as Webbs Wonderful, and New York. This favourite variety produces large crisp, firm heads and crinkled leaves of good colour. Special selections have been made for summer and winter production and are known as Neapolitan Summer Market and Neapolitan Winter Market.

Imperial: The Imperial types of lettuce are now well known among producers. Among the more popular are:—

Imperial 615, which has a semi-exposed heart, is slightly flat on top, and is very firm at maturity. It is a large, spreading variety with numerous wrapper leaves and does best in cool weather, but is adaptable to a wider range of conditions than the other strains of Imperial. Although good crops of 615 have been harvested in summer, it is inclined to bolt and summer-produced heads are somewhat coarse. The leaves are subject to tip burn in hot weather.

Imperial 847 is recommended for summer and autumn production. Heads, which are smaller than those of 615, are round and well folded and hearts are semi-exposed at maturity. It is of good quality and resistant to tip burn.

Imperial 44 is suitable for summer production. It has well-shaped, compact heads, but is not as popular as 847.

Imperial D: Recommended for production in the cooler months, this variety is more subject to tip burn in hot weather than other Imperial strains. Heads are well shaped, very compact, and firm and usually larger than Neapolitan. Leaves are dark green, and the heart is well bleached and crisp. It is a good-flavoured lettuce.

Iceberg is one of the largest-headed varieties. It will stand longer than most varieties after hearting without running to seed head. The outer leaves are dark green with slightly bronzed edges. Hearts are large, firm, crisp, and well bleached. The variety is recommended for summer production and withstands dry weather better than most varieties.

Great Lakes: A recent introduction of the Imperial type, this variety is very suitable for summer production, being resistant to tip burn. It is large and vigorous, with good, firm heads which hold well even in hot weather. Leaves are almost smooth with serrated edges and there are few wrapper leaves. This variety will probably increase in popularity for

A large field of winter lettuce. Sparrow Industrial Pictures Ltd. photo.

RAISING LETTUCE SEEDLINGS

Upper left—Seedlings just pricked out into boxes in a glasshouse. Upper right—Plants raised in a cool frame. At left—Plants growing in open nursery beds. Lower left—The same seedlings as in the upper left illustration but at a later stage; they are ready for hardening off before being set out in the field. Lower right—The method of removing lettuce plants from boxes with soil attached to the roots.

[*Sparrow Industrial Pictures Ltd. photos.*

summer production as it becomes better known.

For the home garden, in addition to the foregoing varieties, the following will find support from many gardeners.—

Cos lettuce: Champion Cos and Paris White Cos. Cos lettuces differ greatly from the common heading type of lettuce and are distinguished by their elongated, loose heads, stiff narrow leaves, and upright habit of growth. Although not popular as a commercial variety, cos is considered by many to be superior to all other types of lettuce in quality. It is suitable for both summer and winter cultivation. When half grown the leaves should be lightly tied together to promote crispness.

Mignonette: An early-maturing, sure-heading variety, with small compact heart. Outer leaves bronze green.

Tom Thumb: Dwarf plant with compact head. Quick to mature, but slow to run to seed. Dark green, smooth-edged leaves.

Propagation

Lettuce seed will keep viable for a long period if stored in cool, dry containers, but rapidly loses its ability to germinate if kept under warm, moist conditions. Old seed should be tested for germination before sowing by placing a quantity on moist blotting paper in a warm situation.

One ounce of lettuce seed contains approximately 17,000 seeds and the approximate number of plants per acre when plants are set out 12in. by 9in. is 40,000.

In Auckland seed may be sown in open beds from September to April, but during the colder months it is preferable to sow seed under glass—either cold frames or a glasshouse. Open beds are generally raised 6in., a convenient width of bed being 4ft. 6in. When the beds are being prepared it is advisable to apply a light dressing of carbonate of lime; 2oz. per square yard would be sufficient in most instances. Approximately a week before the seed is to be sown the fertiliser mixture should be applied and thoroughly worked into the soil; this can comprise 2 parts of superphosphate and 1 part of blood and bone (by weight) and may be applied at the rate of 1lb. per 6ft. of bed (length).

Seed should be sown thinly, preferably in rows 6in. apart, as crowding in the bed tends to increase the prevalence of damping off and other diseases and well-spaced seedlings develop into sturdy plants by the time they are ready to plant out, usually 4 to 6 weeks from seeding.

For raising seedlings under glass the soil should not be too rich or the plants may become too soft and so more susceptible to damping off; for that reason the blood and bone in the fertiliser mixture may be replaced with bonedust.

Suitably sized frames are 5ft. wide by 9ft. long with walls 12in. high at the back and 8in. high in front. These are covered with sliding glass sashes. Plants should be well hardened off, by gradually increasing ventilation each day, before being transplanted to the field.

When raising seedlings in a propagating house the standard seed box 20in. x 12in. x 3in. will be found most convenient. A suitable compost for seedlings is 1 part of loam, 1 part of leaf-mould, and 1 part of sharp river sand, thoroughly mixed and sieved. The boxes should be filled with the prepared compost to within ½in. of the top and firmed ready for sowing. The seed should be sown thinly, approximately 300 seeds to the box, and covered with a thin layer of finely sifted soil. After being watered lightly boxes should be covered with a sheet of glass or paper. The optimum temperature range for germination and growth of lettuce seedlings is from 50 to 55 degrees F. The seedlings should appear in from 4 to 6 days, when the glass or paper covering must be removed.

Young seedlings will be ready for pricking out into other boxes in about 10 days; they should then be spaced 1½in. apart each way. A suitable compost for pricking into is of 4 parts of clean, turfy loam, 2 parts of leaf mould or well-rotted strawy stable manure, and 1 part of sharp sand to which has been added 2lb. of superphosphate and 2lb. of carbonate of lime per cubic yard of compost.

Care must be taken when pricking out not to injure the seedlings by squeezing the leaves or stems. The young plant should be firmed carefully in the soil with the seed leaves just above soil level. The completed box may then be watered lightly, using a very fine rose.

Before being planted in the field plants should be hardened off by being removed from the glasshouse and placed in a sheltered position outside.

An advantage of raising plants in boxes is that they may be cut out in squares when being transplanted and do not receive such a check as plants lifted from beds.

Crop Rotation

It is inadvisable to grow lettuces continually on the same soil, because some of the most serious diseases affecting lettuces are soil borne and continual cropping with lettuces may lead to a serious build up of disease in the soil; field sanitation and crop rotation are methods of preventing this build up. Most of the other vegetables may be used for rotations. Crop rotation is also of importance in maintaining soil fertility, as the different vegetables withdraw varying amounts of different plant foods.

Soil Preparation

Although they will grow on a wide range of soils, lettuces do best on the lighter friable loams. For summer production good moisture-holding qualities are essential unless ample water can be added by irrigation or sprinkler.

Because lettuces develop an undesirable bitterness unless grown quickly, it is important that they be grown in good, rich soil or one that has been well fertilised. Green crops and farmyard manures will do much to provide

[Sparrow Industrial Pictures Ltd. photos.

Methods of planting lettuce for winter production. Left—Five rows to the ridged bed. Right—Three rows to the ridged bed.

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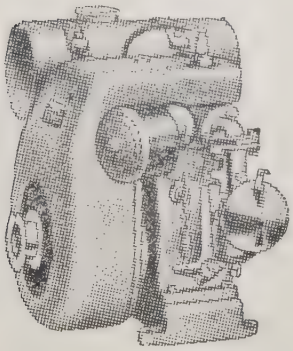

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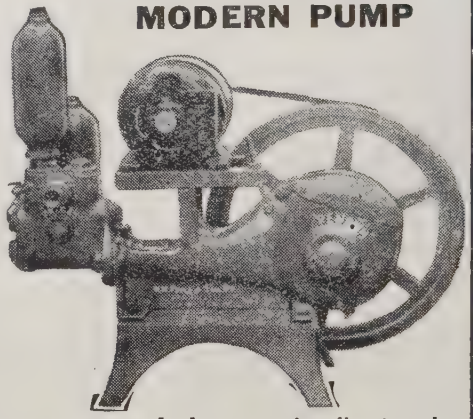

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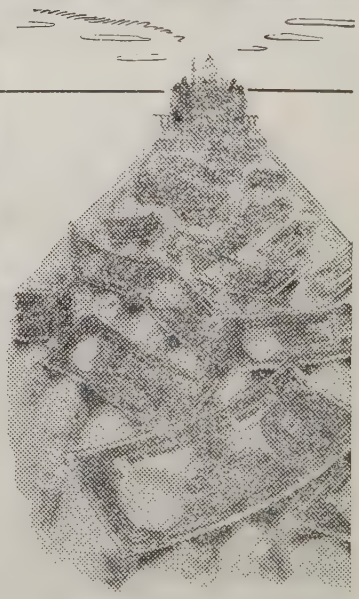

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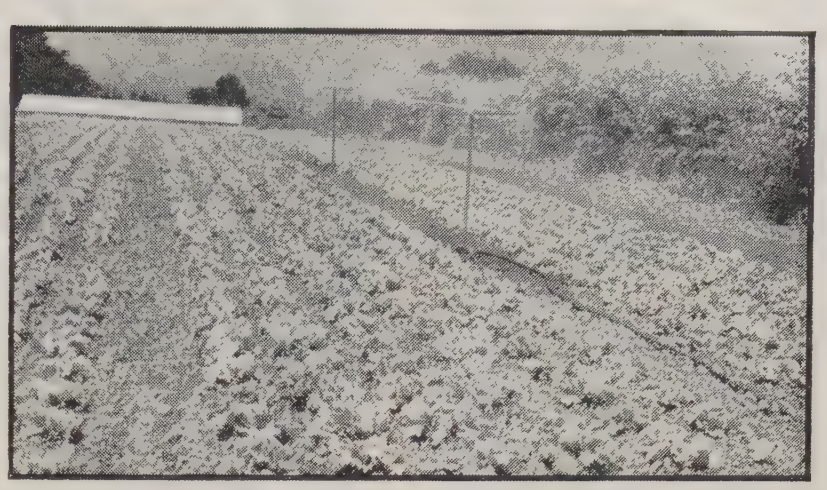
organic matter and improve the fertility of the soil, but any material should be incorporated sufficiently far ahead of planting of the crop to decompose thoroughly.

The land should be worked to a fine tilth before planting and carbonate of lime applied at the rate of 10cwt. per acre. Pasture seldom proves satisfactory for lettuce growing the first season it is worked and it is preferable to grow some other crop in the first season. If land from pasture has to be used for lettuces in the first season, the initial ploughing and working up should be done sufficiently far ahead to secure thorough decomposition of the grass roots. Several cultivations will be advisable before planting to reduce weeds, which are often a problem on land from pasture in the first year.

The base application of fertiliser may be made and worked into the soil with the final cultivation by tine harrows or by shallow discing. The bed is then ready for levelling, which is usually done with chain harrows or levelling board.



[*Sparrow Industrial Pictures Ltd. photo.*
Lettuces planted for summer production: 6 rows to the bed on the flat. The crop is being watered by sprinklers.

Fertilisers

As lettuces must be grown rapidly, an ample food supply should be available, and under most conditions it is necessary to supplement natural supplies by the addition of fertilisers. It is not possible to make recommendations which will meet all needs; little more than broad recommendations can be given.

The fertiliser mixture should be a complete mixture, that is, it should contain the three principal elements, nitrogen, phosphoric acid, and potassium. The main element required for the growth of lettuces is nitrogen and the proportion of this in any mixture should be increased or decreased according to the amount of organic matter in the soil and its natural richness.

The following fertiliser mixture may be used in the average market garden: ¼ part of sulphate of ammonia, 4 parts of blood and bone, 1 part of superphosphate, and ½ part of sulphate or muriate of potash, all by weight.

The usual rate of application is 1 ton per acre, except where the previous crop was heavily manured. If growth is slow, especially during winter, when the natural nitrogen supply of the soil is low, a side dressing of nitrate of soda at the rate of 2cwt. per acre will be of advantage. This dressing must be given before hearting begins and care should be taken to see that it does not come in contact with the plants.

Planting

Lettuces are usually grown in beds of 6 rows. The beds are not raised in summer and are spaced 1ft. 6in. to 2ft. apart, while rows of plants run lengthwise with 12in. between each row.

For winter and spring production raised beds are used to improve drainage and soil warmth. A common width of bed is 4ft. 6in., but this may be increased to 5ft. 6in. The rows of plants run crosswise instead of lengthwise as in summer beds and are 12in. apart; 2ft. is allowed between beds.

Sowing Direct in Field

Although most growers prefer to raise plants in the nursery bed and transplant, it is not uncommon for lettuce to be sown direct in the field. Field sowing is done between October and March and is advisable only when the area planted is not subject to heavy weed growth. Advantages claimed for this system are the saving of transplanting and watering-in costs, less need for watering during dry weather because the plants being undisturbed have produced longer tap roots, and earlier maturity. The plants are also less likely to bolt than if transplanted. The chief disadvantages of this system are the difficulty of preventing weed growth from overrunning the young plants and the work of thinning the plants, which is done when the young seedlings are approximately 2in. high. Field sowing is done with mechanical seeders using from 1½ to 2lb. of seed per acre, and the seed is sown from ¼ to ½in. deep in rows 12in. apart.

Flat Beds

When the young seedlings are to be planted on flat beds the lines are marked out 12in. apart using a wooden marker; this is constructed like a large rake with 3 or 6 prongs spaced 12in. apart. The plants, from 40,000 to 45,000 per acre, should be dug carefully from the seed-bed or cold frame and placed carefully in covered boxes, baskets, or trays and carried to the field.

It is usual for each planter to take a handful of plants and walk with one foot each side of the row and dibble the plants in 9 to 12in. apart. Care should be taken to see that the plants are not set any deeper than they were in the nursery. Each plant should be firmed securely.

This work is sometimes done by contract and an experienced worker can set out as many as 1000 plants per hour.

If conditions are dry at planting time, the newly set out plants should be watered.

After a week in favourable weather the plants should be rooted and showing signs of growth. The crop should be inspected at this stage and where plants have failed new ones should be set out.

Raised Beds

When planting is done on raised beds lines are drawn across the beds 12in. apart. The planter works from paths each side of the bed and so avoids consolidating the bed by walking on it.

Cultivation and Irrigation

Because the plants are shallow rooting, deep cultivation should not be done close to the rows. In friable soil not disposed to cracking during the dry weather cultivation should be shallow and only sufficient to control weeds. More frequent and slightly deeper cultivation may be necessary on heavier soils.

As lettuces should be grown rapidly and without a check to secure best results, watering is generally necessary during dry weather. The usual method of applying water is by overhead sprinklers, the most favoured type being the revolving sprinkler. Watering should be thorough and sufficiently heavy to last the crop from 5 to 6 days in dry weather; 12,500 gallons of water per acre is equivalent to ½in. of rain and this amount can be considered as about the optimum per application for most soils.

Lettuces which have begun to heart should not be watered by sprinkler during bright sunshine, as this may cause scorching.

Harvesting and Packing

When cutting, the heads should be tested for maturity by a gentle pressure of the palm or back of the hand, not the fingers. Each head should be cut just above the lowest leaves.

Lettuces grown in summer should not be harvested during the heat of the day; they will retain their fresh appearance much longer if cut in the early morning while still wet with dew. If lettuces are packed and held overnight before dispatch to market, it is of advantage to sprinkle the heads with water.

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Lettuces are usually graded, those having slightly loose hearts or blemishes, together with small sizes, being graded second.

The usual packages for marketing lettuce are second-hand island orange or banana cases. All discoloured leaves are removed before lettuces are packed and the heads are packed butts uppermost in each layer. First-grade lettuce usually average 36 to the case in spring and summer, being packed in 3 layers each of 12 heads. The cases are not lidded where transport to market is by motor truck. Before dispatch packages should be branded or labelled with the grower's registered mark.

Cultivation under Glass

The demand for winter lettuce is increasing and as the areas which are suitable for winter production are limited, it is probable that indoor cultivation of lettuce will increase. Although tomatoes are the chief glasshouse crop in New Zealand, lettuce would form a useful and profitable catch crop between successive plantings.

The modern type of glasshouse is very suitable for lettuce growing because its construction allows the entry of the maximum of light which is essential for the hearting up of the lettuce, and it provides adequate ventilation, by which losses due to mildew and botrytis are reduced to a minimum.

The best results overseas are obtained in heated houses where a temperature of not less than 50 degrees F. can be maintained.

If lettuce is grown as a catch crop between two crops of tomatoes, the soil can be prepared for the following tomato crop before planting the lettuce, and further base manuring should not be necessary.

Before planting, the beds should be flooded carefully so that the soil is plentifully supplied with water without becoming sodden.

Plants can be set out in rows 10in. apart with 9in. between plants; a house measuring 100ft. x 30ft. would take approximately 4000 plants.

If it is not possible to clear the lettuce crop before the tomatoes are planted, a good method is to mark out the rows where the tomatoes are to be planted and leave them blank. As the tomato plants are set in rows alternately 30in. and 18in. apart, spaces of these widths are available for lettuce. In the 30in. space 3 rows of lettuce are planted, approximately 10in. apart from plant to plant, and in the 18in. space 1 row is placed.

It is essential, however, that lettuces be cleared before tomatoes are sufficiently advanced to throw too much shade.

Plants should be raised inside the house either in boxes or in a seed-bed specially prepared in the glasshouse, for if raised outside in cold frames, etc., there is a likelihood of their contracting disease and so contaminating the indoor area.

For the first 2 or 3 weeks after the plants begin to grow temperatures should be kept about 60 degrees F., and when the plants show signs of hearting should be dropped down to 50 degrees F., as they will not heart up properly at a high temperature.

Ventilation is important, and must be adjusted according to the weather, but whenever possible plenty of fresh air should be allowed. Moisture should not be allowed to condense on the inside of the glass; it is a sign that the air is too humid and more ventilation is necessary.

After planting, a little water should be given to each plant to consolidate the soil around the roots and to supply sufficient moisture for quick rooting. No further water should be needed for at least 10 to 14 days. The soil should never be allowed to become too dry, as this causes the lower leaves of the plant to drop and stops the circulation of air around the plant; moisture is liable to accumulate on the undersides of the leaves and provide suitable conditions for botrytis infection.

All watering must be done carefully and must not be applied overhead, because if moisture lies in the centre of the rosettes, serious infection from botrytis may result.

Varieties

Special varieties are required for indoor culture and these must be selected with due regard to the temperature at which the house will be heated and to local conditions.

Hearting of the lettuce is the main problem in the glasshouse; some varieties require long hours of daylight for hearting, others will form hearts during shorter days and will bolt on long sunny days. The glasshouse grower is mainly interested in the short-day varieties.

In England the varieties mainly grown in heated houses belong to the "Gotte" group. In appearance these varieties are distinguished by their rounded leaves and compact, almost globular-shaped hearts. The lower leaves do not spread over the surface of the soil; practically all go to form the heart.

Cheshunt Early Giant, a large, bright, clear-green lettuce, is an excellent variety for heated glasshouses. It forms a good heart, even in the short days of winter and under low light intensity.

Cheshunt Early Ball: This is a medium-sized, compact lettuce, suitable for cultivation in heated or unheated glasshouses, which has round and bright green foliage. It has few outer leaves and a large solid heart. The seeds are grey.

Green Frame, a useful variety for heated and unheated glasshouses, succeeds with less heat than the other varieties mentioned. It is a large lettuce with dark green foliage.

Varieties suited for unheated glasshouses are of the May Queen type and are somewhat similar to the Gotte type, but develop more slowly, and longer hours of daylight are required for hearting. The group includes outstanding cool-frame varieties and some can also be grown out of doors, particularly in the spring, but they are not suitable for winter growing. The leaves are more crinkled than those of the Gotte type, the hearts less solid, and the lower leaves tend to lie flat on the ground. A reddish tinge on the edge of the leaves is characteristic of several varieties in this group, but is scarcely apparent when plants are grown quickly in a cool frame or glasshouse.

May Queen (sometimes called May King): This strain varies considerably; some are more desirable than others. In the early stage large plants with a spreading habit are formed, which later form a good heart. They are usually resistant to mildew. This is one of the best varieties for cultivation in unheated houses and in cool frames.

Forcing Milly: This variety is smaller than May Queen, and when grown out of doors more tinged with red. Foliage is dark green. It is suitable for cool-frame and glasshouse culture, but is susceptible to mildew. It should not be confused with Milly, which is a different variety.

Rosy Spring, a variety that has attained a certain popularity in the north of England because of its resistance to mildew, is larger than Forcing Milly and matures more rapidly.

[*Sparrow Industrial Pictures Ltd. photo.*
Packing heads of lettuce into cases.

Majestic: This variety resembles May Queen and in mild districts can be grown out in the open.

In the Auckland district, where it has not been a general practice to grow indoor lettuce, intending growers would be well advised to try the varieties mentioned and select the more suitable ones for further culture.

Control of Diseases and Pests

To assist in the recognition and control of diseases affecting lettuces the following description of the most important diseases affecting crops in the Auckland district is given:—

Damping off (*Pythium ultimum* and *Corticium solani*) is mainly a seed-bed trouble. The leaves of very young plants flag and lose their lustre, due to the destruction of the tissues of the stem near the soil. This disease may be caused by any one of a number of soil fungi, but usually by *P. ultimum* and *C. solani*.

Control: Avoiding excessive moisture and providing good ventilation will help to reduce the development of damping off. Where the disease is prevalent soil should be sterilised with steam, formalin, or chloropicrin, or the plants raised in fresh soil each time.

Downy mildew (*Bremia lactucae*) is sometimes troublesome in the seedling bed and may also attack the older plants in the field. It causes pale spots and later a white downy growth forms on the underside of the leaves. The disease may be serious in badly ventilated or badly drained houses.

Control: Plants should not be grown too thickly in the seedling bed; excess wetting of the foliage should be avoided. Where the disease is prevalent spraying with Bordeaux 3:4:50 when the foliage is dry is effective in controlling the disease.

Ring spot, sometimes called "rust", is caused by the fungus *Marssonina panattoniana* and is mainly troublesome in autumn, winter, and spring. It produces small circular brown spots about $\frac{1}{8}$in. in diameter on the leaves and sunken, brown, insect-like markings on the undersides of the midribs. Early infection may cause plants to become stunted and later infection disfigurement, making the removal of an excessive number of wrapper leaves before marketing necessary, or it may disfigure the plant to such an extent that it is unsaleable.

Control: Crop rotation should be practised; as infection may be carried over in the soil, it is important to burn all infected plants and debris and not grow lettuce on land that has recently carried an infected crop. As the disease can also be carried on the seed, it is advisable to treat seed just before sowing with copper carbonate or copper oxychloride, using 2 level teaspoons of dust to $\frac{1}{2}$lb. of seed; this should be well shaken in a closed tin, then removed, and excess dust sieved out. Where the disease is prevalent the plants should be sprayed at 10- to 14-day intervals from seedling stage onward with Bordeaux mixture 3:4:50 or copper oxychloride.

"Drop" disease (*Sclerotinia sclerotiorum*) is more prevalent in summer. Very young plants affected by the disease wilt and die rapidly. The fungus attacks the plants at ground level, causing the leaves to collapse suddenly. Affected plants ultimately become soft and watery, and are permeated with the copious, white, fluffy mycelium of the fungus. Large black sclerotia or resting bodies are formed and these can live in the soil until the following season and cause infection of further crops.

Control: Prompt removal of affected lettuces with a little of the surrounding soil will prevent sclerotia being left in the soil and infecting later crops. All debris should be burnt and not placed on compost heaps. Spraying the plants with Bordeaux mixture 3:4:50 is also helpful in the control of this disease.

Grey mould (*Botrytis cinerea*) is very destructive to lettuce in the open ground, in frames, and in glasshouses. During spells of moist weather or under winter conditions when the lettuce plant is not making rapid growth infection is likely to occur. Damaged leaves are readily attacked by the fungus, which causes first a reddish discoloration and subsequently the stem may rot entirely. The ashen grey fructifications of the fungus are produced in abundance on the decaying leaves and the disease is thus spread rapidly from plant to plant. Small black resting bodies are formed which may remain in the soil and lead to infection of later lettuce crops.

Control: The disease is difficult to control, although Bordeaux mixture 3:4:50 seems to give some control, especially against the spread of the disease. When planting out, seedlings with damaged leaves should be discarded, as these are liable to attack by the disease. Plenty of water should be applied before planting out so that subsequent watering may be reduced. When applying water avoid wetting the plants. It is sound practice to examine the plants each day and collect and destroy any withering leaves and any plants affected with botrytis. This is especially important during wet, humid weather.

Mosaic: The importance of this virus disease in Auckland has been recognised only within the last few years. The trouble is due to a virus which is transmitted from plant to plant by aphides or greenflies. The symptoms on winter-planted lettuce become strikingly apparent in the spring. The affected plants are usually dwarfed, with leaves mottled with light and dark green and much crinkled. There is little or no hearting, so that seriously affected plants are useless for market. The virus is seed borne and a few affected seedlings, with mottled leaves, may usually be found in the seed-beds; these should be destroyed immediately.

Control: Spraying plants in seedling beds with nicotine sulphate, 1 : 800 plus soft soap 3lb. to 100 gallons of mixture, is effective against aphides, which are the main cause of spreading of mosaic. As the virus is found in certain weeds of the daisy family, particularly in groundsel, and is liable to be transmitted from these weeds to lettuce by aphides, all weed growth should be kept down. All old and useless crops should be destroyed as soon as possible and crop rotation should be practised.

Tomato spotted wilt: This is a virus disease common on many kinds of plants. Infected lettuce plants show a yellowing of the leaves with a brown discoloration which often extends to the heart of the lettuce. The outer leaves may show extensive brownish dead areas, while those near the centre may bear only slight discoloration along the veins. All leaves showing discoloration are usually distorted and the plant displays one-sided growth.

Control: Any plants showing the symptoms of the disease should be removed immediately and destroyed. As many weeds carry the virus, the land where lettuce is growing and surrounding areas should be kept free of weeds.

Spraying the plants in the seedling bed with D.D.T., 1lb. of 50 per cent. wettable powder in 100 gallons of water, is effective against thrips which are the main cause of spreading spotted wilt. It is doubtful if spraying with D.D.T. or nicotine sulphate after the plants have been set out in the field is beneficial. While the majority of the insects would be killed by the sprays, the smaller proportion which escape are likely to spread the disease further afield, because they will be disturbed by the spraying and, as a result, will travel greater distances.

Insect Pests of Lettuce

Lettuce is subject to attack by several kinds of insects, the principal ones beings slugs and snails, the cabbage looper caterpillar, and aphides. The actual damage done by these insects to lettuce crops in commercial areas is generally so small as to be insignificant, but they sometimes cause losses in home gardens.

Slugs and snails can be controlled by dusting the plant with calcium oxide. This should be applied in the evening and when the foliage is dry. A bait made up of 1oz. of metaldehyde and 3lb. of bran or oatmeal and spread over the area where the lettuce is growing is also effective.

Looper caterpillar: This insect feeds on lettuce and may cause trouble during some seasons.

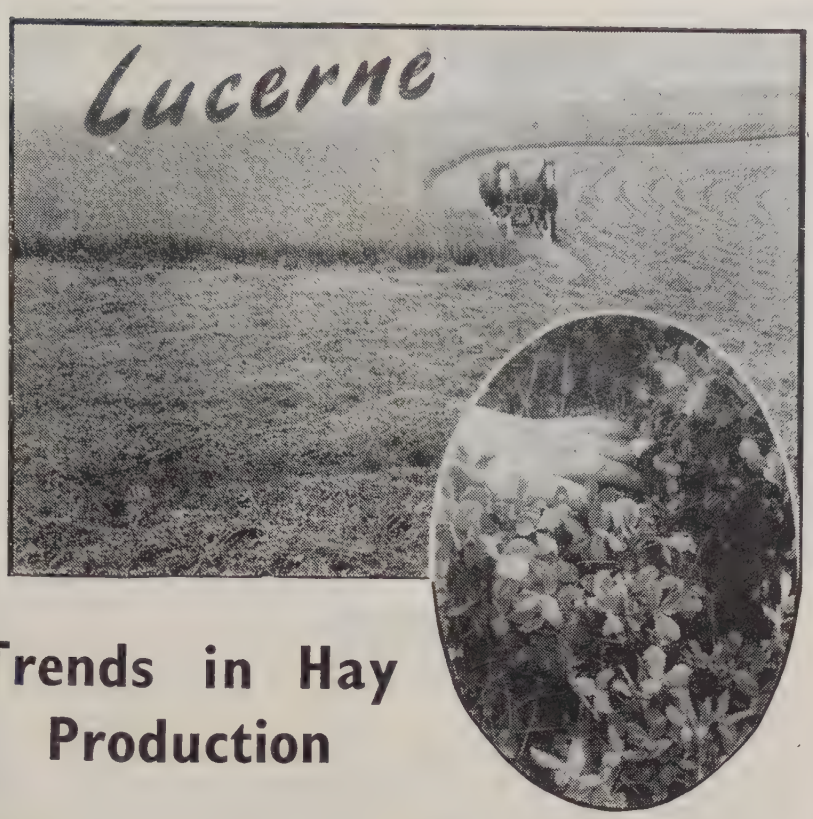
Control: D.D.T. wettable powder, 1lb. of 50 per cent. in 100 gallons of water plus a spreading agent, for example, casein, or a D.D.T. dusting powder at the rate of from 10 to 25lb. to the acre, according to the amount of foliage to be covered, may be applied. Spraying or dusting should not be carried out after the plants are half grown because undesirable residues may still be present at time of harvesting.

Aphides (plant lice): These are sometimes troublesome on lettuce; as they are the vectors of mosaic virus disease, it is important that they be controlled.

Control: A nicotine-sulphate spray, 1:800 plus soft soap 3lb. to each 100 gallons of mixture, should be applied; for a small quantity of spray use 4/5 fl. oz. (5 teaspoons) of nicotine sulphate and 2oz. of soft soap to 4 gallons of water.

Acknowledgment

Acknowledgment is made to the Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, for checking the sections dealing with pests and diseases and recommendations for their control.



Trends in Hay Production

FOR many years the Department of Agriculture has advocated the growing of lucerne for hay in those districts where experience has shown that the crop can be a success. Throughout the country the area so used has fluctuated widely, and in this article officers of the Extension Division attempt to find the reasons for the differing trends. This first part deals with the North Island, and the second and concluding part, which will appear in next month's issue, explains trends in the South Island.

THE total acreage of lucerne grown for hay expanded fairly steadily after the First World War. In 1927, 29,000 acres were harvested and in 1944 a peak of 46,000 acres was reached. A study of the statistics over the past 20 years has revealed some quite distinct trends. In some areas the acreage has remained fairly constant while in others a fairly steady expansion has taken place. In still other areas the acreage first increased, but then fell away.

In the North Island generally the area of lucerne cut for hay increased rapidly from 12,000 acres in 1927 to more than 20,000 acres in 1935, since when there has been a comparatively steady decrease to below the 1927 acreage. In the South Island, however, from 1927 to 1933 the area of lucerne grown for hay was about 16,000 acres, but the acreage increased rapidly to 33,000 in 1944.

Much has been written about lucerne growing and doubtless much more will be written, but it is certain that some of the advice and instruction disseminated in past years has acted as a hindrance to the wider cultivation of this crop.

The original idea in New Zealand was that lucerne should be grown in 28in. rows and intercultivated. This took so much labour that, though many successful crops were grown by an older generation, most farmers preferred to rely on the hay produced from ryegrass and red clover pastures.

Stress was also frequently laid on the necessity for a rich river flat or a silt loam with a reasonably high water-table to grow lucerne successfully. Though these soil types are ideal for the purpose, other soils will also establish successful stands and maintain them long enough for them to be a practical proposition.

The cost of sowing a lucerne stand has also been regarded as a decided drawback, but there is little difference in the cost of preparing an area for lucerne and that of preparing for a good pasture mixture. The cost of lucerne seed is about £2 10s. to £3 10s. per acre, and a pasture sowing may cost from £2 to £4 10s. per acre, depending upon the mixture used. When the relative values of the production of the two types of sowings are considered lucerne does not suffer by comparison with a mixed pasture.

Several other factors have combined to increase the popularity of lucerne. The discovery that the bacteria essential for healthy growth could be introduced by treatment of the seed has done away with the laborious process of spreading soil from a successful stand on to the area to be established. Appreciation of the value of lime and phosphates in the establishment and maintenance of lucerne stands has eliminated many of the failures experienced in earlier years, and attention to the pre-cultivation and consolidation of the seed-bed has further reduced the risk of poor establishment of the stand. The advent of the pick-up hay baler has also encouraged the growing of lucerne for hay. The baler is not only an answer to the labour problem, but, because of the reduced handling, it enables the hay to be conserved with a minimum loss of leafage, which is the most nutritive part of the plant.

When these facts are considered a rapid expansion in the acreage of lucerne grown for hay might be expected. Under what conditions has such expansion taken place and what has hindered it in other districts?

NORTH ISLAND DISTRICT TRENDS

In the North Island ploughable land is generally used for dairying and fat-lamb raising. Supplementary cropping is not a common practice, stock being carried almost entirely on the product of pastures, particularly on those farms where these are in good heart. Lucerne could not be expected to replace much of the rich pastures which are the basis of cheap fat-lamb and dairy production, but it can supplement the production of these pastures and replace to some extent the greenfeed and roots grown for summer feeding.

On fat-lamb farms most lambs are sold fat off the mothers and a supplementary fattening feed is not required. Even at lambing time it is possible in most districts to provide sufficient feed from pastures alone.

On dairy farms, however, production must be maintained as high as possible for a much longer period. It is on these farms that lucerne can make a very valuable contribution. Most dairy farmers provide pasture hay for winter feeding, but the growing of lucerne to produce additional supplies and also to provide green fodder in summer is not so general.

Apart from the over-all trends throughout the country, certain district trends are also very evident and these are now discussed.

North Auckland

The area of lucerne in the North Auckland Land District is so small that trends are not worth much study. The area cut for hay increased to 471 acres in 1930-31 and remained fairly stationary at about this figure until 1936-37, since when it has fluctuated at lower levels. Generally the soils of North Auckland are not suitable for lucerne. Most of them are heavy in texture with a tight subsoil. It is generally recognised that lucerne does not thrive on such soils. Many of the areas of lighter soils are much leached of plant food and will not grow lucerne well enough to warrant any attempt at its establishment.

There are a few areas of soils of light texture which are suitable for lucerne, including the Red Hill sandy soils of the west coast and the immature volcanic soils near Auckland, Whangarei, and Kaikohe. The former soils grow lucerne very well indeed, but on the volcanic types the stands have not been quite so vigorous. On both these soil types lucerne is grown

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to a very small extent, although expansion of the area for both hay and silage appears warranted.

Paspalum is very prevalent in North Auckland and usually provides enough grazing in summer and autumn, so that lucerne, even if grown, would seldom be required for that purpose. In very dry seasons, when growth from paspalum is slow, lucerne growth is also slow, and the limited area on which lucerne could be grown for grazing would not be of great assistance. On the heavier and infertile soils the growing of lucerne is too difficult to warrant its establishment. The enthusiasm among the few farmers who attempted to grow lucerne on such soils waned after the discovery that the crop did not do well on their farms.

Bay of Plenty and Central Plateau

The acreages for the counties of Opotiki, Tauranga, Whakatane, Rotorua, and Taupo have been grouped, though the coastal (Bay of Plenty) and the inland (Central Plateau) portions of this area are quite distinct. The highest acreage saved for hay in Rotorua and Taupo Counties is only 200, however. The coastal portion of Whakatane County is similar to Opotiki and Tauranga Counties, but the conditions in the inland portion, comprising the Galatea district, are more allied to those in Taupo and Rotorua Counties. The appreciable acreage of lucerne grown in Whakatane County cannot be divided between these distinct areas, however, and the trends for the whole area have accordingly been grouped.

Bay of Plenty

The soils of the Bay of Plenty are generally well suited to lucerne growing. Paspalum, however, is very prevalent and restricts the area sown to lucerne. The area of lucerne increased from 550 acres in 1928 to 1800 acres in 1938, since when it has remained fairly stationary, with sudden temporary fluctuations which may in part be accounted for by increased cuttings in areas such as Galatea which are normally used for grazing only.

Lucerne is a valuable crop in the Galatea district, where dry conditions in late spring, summer, and autumn inhibit grass growth. Winters are cold and settlers are relying more and more on lucerne to provide grazing in the dairying season and hay in winter. Increased sowings in this area account for much of the increased acreage of lucerne in the Bay of Plenty, and wider use of lucerne can be expected at Galatea and on other areas of light soils in the coastal belt which dry out in summer. Farmers on soil types which do not dry out undoubtedly have not taken a very great interest in lucerne, as they can get high production figures without it.

An excellent stand of lucerne, 10 months after sowing.

Nevertheless the crop does well on most of this land and on dairy farms should replace much of the pasture cut for hay and silage. Pasture cut for hay usually deteriorates, whereas lucerne thrives best under such treatment. Lucerne well saved makes better hay than hay well saved from meadows.

Perhaps the reasons for the relatively small acreage in the Bay of Plenty are the greater difficulty in harvesting the crop, including the necessity for making the first cut into silage, and the need for harvesting to be extended throughout the season, upsetting to some extent the farming routine. However, for the second and third cuts of lucerne better harvesting weather is usually available than in December, when the bulk of meadow hay should be saved, while weather for the fourth cut is about as good as any in that month.

The Central Plateau

The farming potentialities of the Central Plateau have been only slightly realised. Lucerne grows very well in this locality and suffers no competition from paspalum. It should, therefore, have a definite place when farming develops. So far little interest has been shown in the crop, and this may be partly for the same reasons that were given for the small acreage in the Bay of Plenty. In this district the crop requires ample supplies of phosphate and the shortage of this fertiliser in recent years and the underdeveloped state of the district generally would account for lack of progress in lucerne growing.

Waikato

The Waikato district includes the middle basin of the Waikato River and the area drained by the Piako and Waihou Rivers. The area cut for hay at the beginning of the 20-year period under review was slightly more than 1100 acres. This increased fairly steadily to 3800 acres 10 years later, but has since declined to under 2000 acres.

The chief lucerne-growing counties in this region are Waikato, Waipa, Piako, Matamata, and Otorohanga. Very little lucerne is grown elsewhere. The soils of Hauraki Plains County are generally too wet or rather peaty in nature and therefore unsuitable for lucerne, and Raglan County is generally steep and devoted mainly to sheep farming. In the remaining counties there are large areas of peat and heavy, wet soils, and in the north Waikato heavy, poor soils and steep country unsuitable for lucerne growing. Alongside these, however, there are large areas of land of varying degrees of suitability for lucerne. The light, sandy soils on the flats and on the rolling country are particularly suited when treated with the necessary fertilisers. The heavier clay loams are not as well suited, but nevertheless can grow good crops of lucerne.

Paspalum is not the serious competitor it is in the Bay of Plenty or North Auckland districts. The acreage figures do not reveal any real interest in lucerne, which, nevertheless, should have a place on the more suitable soil types for provision of silage and hay and for green fodder in summer when required. The lack of interest in lucerne growing in these areas can be attributed to difficulties in saving the crop for hay and the need for frequent cutting.

LUCERNE ACREAGES CUT FOR HAY AND SILAGE

District	Average of 5-year period			
	1928–32	1933–37	1938–42	1943–47
North Auckland	275	365	275	205
Bay of Plenty and Central Plateau	815	1,565	2,025	1,970
Waikato	2,205	3,175	3,110	1,800
King Country	15	85	95	90
Taranaki	3,125	2,710	1,100	475
Wellington west coast	2,655	3,375	2,845	1,715
Poverty Bay (excluding Opotiki County)	1,090	1,365	900	710
Northern and central Hawkes Bay	4,180	4,860	4,720	3,900
Southern Hawkes Bay	305	435	425	395
Wairarapa	470	1,040	945	660

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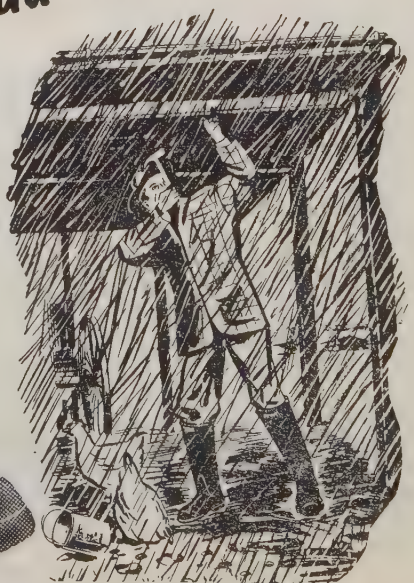

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King Country

The King Country district is so rugged and dairying is so little practised that lucerne has little place over large areas of it. The soil of the rolling country and some flats is suited to lucerne growing, and little paspalum is evident. The district, owing to a well-spread rainfall, does not normally suffer from drought, but further areas of lucerne might well be grown.

Taranaki

In north and central Taranaki the area used for lucerne growing has never exceeded 200 or 300 acres. Lucerne has been tried on many farms over the years, and on most, if not all, of the volcanic soils and recent river-silt soils of the district. Good stands can readily be established, though annual weeds are often troublesome, but good stands are very difficult to maintain because of a climate favourable to grass and weed growth. Whereas in drier and colder districts lucerne areas remain free from weeds and grass through the hot, dry summer following the first cut, and through the winter under heavy frosts, in north Taranaki the frequent wet summers result in heavy weed and grass invasion between cuttings, and the relatively mild winters also favour the growth of weeds and grass. Twitch grasses are particularly troublesome in lucerne areas on the light, volcanic soils.

Because the lucerne stands are difficult to maintain and grass growth in pastures is sustained with little check from the spring through to the autumn, lucerne growing in north and central Taranaki is not likely to make progress. The frequent loss of good lucerne hay through continued wet weather and the generally plentiful supply of grass for greenfeed throughout the summer are further reasons for lack of interest in the lucerne crop.

In south Taranaki and Patea and Waitotara Counties of Wellington Province the story of lucerne is a little different. Summers are considerably drier in Waimate West, Hawera, Eltham, and Patea Counties, and along the coastal belt of Waitotara County, where the light, free draining, volcanic soils are admirably suited to lucerne growing. In these counties the area used for the crop expanded rapidly on dairy and fat-lamb farms from the early 1920's until 1931, when it had increased to almost 4000 acres. Since 1933, however, there has been a rapid decline and the area is now about 300 acres.

Lucerne growing in these counties developed during a period when dairy cow and ewe populations were increasing rapidly, but the capacity of the pastures was insufficient to maintain both summer and winter feed for these increases. Unlike north Taranaki, the climate in this area is generally satisfactory for the harvesting of good hay from lucerne stands, and though winter conditions permit invasion by weeds and grasses and are the general cause of stands being broken up, the stands last much longer than they do in north Taranaki. Conditions, too, are generally much more favourable in south Taranaki for the eradication and control of weeds and invading grasses.

There are, however, definite reasons for the reduction in area of lucerne stands in this district, the most important being the build-up of the fertility and carrying capacity of the pastures through heavier topdressing and increased stocking. As the pastures have improved with more perennial ryegrass and white clover, so the growth period has extended further into the summer and autumn, and winter growth has increased. Moreover it was found that by concentrating on pasture management and the better use of pastures for hay and silage production there was less need for lucerne, with its continued demand for attention for haymaking throughout the summer. As good management and utilisation of pasture brought more all-grass farms to the fore on the basis of butterfat production per acre, it was evident that lucerne growing could be eliminated.

Occasional hot, dry summers, when pastures are dry and bare, cause the south Taranaki dairy and fat-lamb farmers to question the wisdom of being without a stand of lucerne. They would welcome a good grazing type as a safeguard against such seasons, but are not prepared to sacrifice the all-year-round production from a good pasture and have the trouble of harvesting several crops of hay, particularly in wet seasons, for the sake of having green lucerne for an occasional dry season. For some time at least, therefore, lucerne is not likely again to become of real importance in this area.

Wellington West Coast

In the Wellington west coast district, extending west of the ranges from Makara to Wanganui and including the inland counties of Waimarino, Kiwitea, and Pohangina, the growing of lucerne has never become general on either dairy or fat-lamb farms. The area in lucerne increased from about 100 acres in 1927 to 2200 acres by 1936, but it has decreased again to 1200 acres.

Most of the lucerne in the district is grown on the sandy soils bordering the coast. Because of the excessive and early drying out of much of the pasture land on these sandy soils, the value of lucerne has been outstanding, and only the difficulty of establishing a good stand on this type of soil has restricted its use.

Good use of lucerne is always made on a number of farms on the sandy, sandy silt, and gravel soils near some of the larger rivers where excessive drying out of pastures occurs frequently enough to emphasise the need for a special supply of greenfeed. Generally, however, with the two exceptions mentioned, pastures in the district are able to provide adequate green and dry feed to maintain satisfactory carrying capacity throughout the year.

With the exception of the heavier clay subsoils of much of the rolling and terrace lands in the district, most of the ploughable soils are well suited to the growing of lucerne, and stands can be maintained for more than 10 years before weeds and grass reduce production and make ploughing necessary.

However, lucerne growing is not likely to increase to any extent in the inland districts, but there is a very definite place for expanded production from the 150,000 to 200,000 acres of coastal sand country.

Lucerne can be established satisfactorily on a large proportion of this country, and its part in summer greenfeed production and in the provision of good, nutritious hay makes it a valuable supplement to the pastures on these light, rapidly drying soils. The acreage in lucerne in the coastal counties should increase, and actually has increased in the Manawatu, where the highest acreage yet recorded was returned for 1947.

Poverty Bay

In Poverty Bay the climate and area of soils suitable for lucerne growing are fairly restricted. The Poverty Bay flats and parts of the flats at Tolaga Bay and Ruatoria, with smaller areas

[*Green and Hahn Photography Ltd. photo.*
Lucerne supplies an excellent reserve of fodder.

[*Green and Hahn Photography Ltd. photo.*
A horse-drawn mower cutting a heavy crop of lucerne.

of river flats and similar soils along the coast, are well suited to this crop. During the period 1927 to 1938 the acreage remained fairly steady at 1000 to 1500, but since 1938 the area has been reduced by about half. This is mainly caused by the decline in dairying, there being a close relationship between the lucerne acreage and the number of dairy cows. Some of the reduction is accounted for by the increase in recent years in red clover crops, which are used for seed cropping, the provision of hay, and the supply of greenfeed in late summer. In particularly dry seasons the red clover areas are specially valuable.

In Poverty Bay very dry conditions are experienced often enough to warrant special efforts on the part of dairy farmers, fat-lamb producers, and sheep and cattle farmers generally to provide more efficiently for such seasons. The lucerne crop, particularly on the Gisborne flats and other areas built up with river silts, is eminently suitable for this purpose. The small areas of dairy and other small holdings do not justify the introduction of mechanical methods of haymaking, but on other farms the provision of equipment which can reduce to a minimum the labour required to handle successive crops is well worth while. These methods, coupled with adequate storage capacity, enable farmers on such country to provide for every eventuality caused by weather. Also, good lucerne hay can always be disposed of at satisfactory prices, and in Poverty Bay a surplus of this excellent fodder would generally be welcome. On many soils in this district lucerne yields very well, and the life of the stand is generally long enough to justify the work and cost involved in establishing an area.

Central and Northern Hawkes Bay

The area in lucerne in central and northern Hawkes Bay ranged from 4000 to 5000 acres during the period 1927 to 1945, since when it has declined to about 3500 acres. This decline is difficult to account for, as severe droughts are frequent. On more than one occasion recently considerable quantities of hay have had to be brought into the district, and frequently large numbers of stock have had to be sold at sacrifice prices.

In Hawkes Bay, Waipawa, and Waipukurau Counties there are upward of 100,000 acres well suited to the growing of lucerne. The falling-off of dairying and the decline in dairy cow numbers account for most of the reduction in lucerne acreage, as the dairy farmer with his small patch of lucerne to provide both hay and greenfeed accounted for most of the area. The fat-lamb farmer and the sheep and cattle raiser have not developed lucerne growing as such farmers have done in other countries, such as U.S.A. and Argentina, with similar climates. The objection of the smallholder that the harvesting of lucerne hay takes too much time and labour each season does not apply on the larger holdings, where, because of the favourable climate for harvesting, this work can be mechanised.

To provide for the occasional but still too frequent very dry season and subsequent dearth of fodder for the winter good storage facilities for the baled hay are necessary. The value of adequate storage for produce from a good area of lucerne is worth while and has been well demonstrated by those sheep and cattle men who have profited in recent years by being able to hold all livestock through the most severe droughts. Lucerne hay always brings a good price in Hawkes Bay, and for any surplus not required locally there is generally a good market in outside districts, because the favourable climate results in comparatively high-quality produce. Lucerne appears to be the ideal crop to enable the bigger landowner to provide a reserve of fodder for all kinds of stock as an insurance against drought and to carry his stock through instead of having to dispose of them on an unsatisfactory market.

Southern Hawkes Bay

In southern Hawkes Bay for the past 20 years the area of lucerne has fluctuated between 250 and 500 acres, with no decided trends being shown. The climate generally is not suited to lucerne growing and the acreage has never been large. No lucerne at all is grown in Akitio and Weber Counties, which are mainly hilly country, and in Pahiatua County. In these areas pastures, including special red clover areas, and root and green fodder crops are relied on for all stock requirements. In parts of Woodville County and in Dannevirke County the area in lucerne, though still small, recently has shown a decided increase. In both these counties there are soils where lucerne does particularly well, and in Dannevirke County considerable areas of such land could be devoted to this crop. Occasional very dry seasons in these districts have encouraged farmers to establish lucerne stands and these have been found invaluable in providing additional reserves of hay and for use as greenfeed when pastures have dried out completely. The success of an increasing number of good stands around Dannevirke, where weed and grass invasion is relatively slower than in many other districts, is likely to encourage more farmers to establish an area of lucerne.

Wairarapa

The area in lucerne in the Wairarapa increased rapidly from about 400 acres in 1930 to almost 1200 acres in 1937. Since then it has steadily declined and now is down to about 600 acres. Except for Eketahuna County, where the rainfall is too high and too well distributed for lucerne, the climate in the Wairarapa is very suitable for this crop, and the frequent very dry summers, with bare pastures, should encourage its wider use. Such counties as Masterton, Wairarapa South, and Featherston need good reserves of hay to carry stock through in seasons of drought and in very cold winters; also these counties have considerable areas of light, shingly soils and river-silt soils where lucerne does well, while, with drainage, much of the rolling clay subsoil country also grows good crops. The growth of grass and weeds in lucerne stands is not as bad here as in Taranaki.

Despite these favourable conditions, and the need for summer-grown feed and extra winter-feed reserves, lucerne has not made the progress in the Wairarapa that the value of the crop would appear to warrant. The only reason that can be given for the decline in lucerne is that a good deal of labour is needed to handle the successive hay crops, so that other methods of providing feed for stock are preferred. Red clover does particularly well in the Wairarapa, and the area in this crop cut for hay and seed has shown a marked increase in recent years, particularly in Masterton County. Cowgrass and Montgomery red clover provide good greenfeed during late summer after giving a good hay or seed crop. Here the improvement in pastures in recent years and the extended use of subterranean clover have also provided additional grazing, with an increased acreage cut for hay.

Though climate and soils in the Wairarapa are suitable for a considerable crop of lucerne, an endeavour has been made to provide more easily handled crops for periods of feed shortage.

POISONOUS PLANTS IN NEW ZEALAND

THIS is the ninth section of a series of descriptions of poisonous plants which grow in New Zealand by H. E. Connor, Botanist, Department of Scientific and Industrial Research, Wellington. The series is appearing monthly in the "Journal", and glossaries to be used with the series were published with the first section, which appeared in the October, 1950, issue.

Fig. 19—A: Bittersweet (*Solanum dulcamara*). B: Boxthorn (*Lycium ferocissimum*). C: Jerusalem cherry (*Solanum pseudocapsicum*).

DICOTYLEDONS

Solanaceae

African Boxthorn. *Lycium ferocissimum* **Miers. (Fig. 19, B)**

Botanical description: Habit—Erect, densely and stoutly branched, spine-bearing shrub up to 3ft. or more tall. **Leaves**—Subsessile, spathulate-oblong, glabrous, about ¾in. long. **Flowers**—Small, whitish, with slender corolla tube. **Fruit**—Globular, scarlet berries. (South Africa.)

Habitat: Hedge plant.

Distribution: Sparingly naturalised in several localities in both islands.

General: In New Zealand instances of boxthorn poisoning in poultry have occurred when the leaves were eaten. African boxthorn has been suspected of poisoning pigs in Australia. The related Chinese boxthorn, *L. chinense* Mill., which has longer leaves and few to no prickles, occurs as a garden escape and has become established in waste places in both islands. There is no evidence other than close relationship to African boxthorn for suspecting Chinese boxthorn as a poisonous plant.

Poisonous principle: Not known.

Bittersweet. *Solanum dulcamara* **L. (Fig. 19, A)**

Botanical description: Habit—More or less pubescent or sometimes glabrous, shrubby climber with stems 4 to 6ft. long. **Leaves**—Entire or sometimes 3 to 5 parted, 1 to 3in. long, the entire ones cordate or ovate-cordate, or the upper ones hastate. **Flowers**—Many, in drooping panicled corymbs opposite the leaves; corolla white or violet, ½in. in diameter. **Fruit**—Ovoid, red or rarely yellowish green berry. (Europe.)

Habitat: Scrambles through hedges; may form thickets.

Distribution: A few swampy areas in both islands; cultivated in gardens.

General: The distribution of bittersweet is not great in New Zealand at present, which probably accounts for the absence of known plant poisonings. Bittersweet is recognised as a poisonous plant, as horses, sheep, and cattle have occasionally been poisoned by eating it. A somewhat disagreeable odour given off from the crushed leaves should persuade stock to leave the plant ungrazed. Leaves, stems, and berries are poisonous, as all parts of the plant contain the toxin.

Symptoms of poisoning are headache, nausea, emesis, and gastritis. Larger doses produce central nervous paralysis and even heart disturbances. Local irritation and haemoglobinuria may also occur.

Poisonous principles: The colloidal alkaloidal glycoside solanine, which can be hydrolysed under acid conditions to the more readily absorbable solanidine, is present throughout the plant. Solaceine has been recorded for bittersweet, and this is also hydrolysable under acid conditions to solanidine.

Jerusalem Cherry. *Solanum pseudocapsicum* **L. (Fig. 19, C)**

Botanical description: Habit—Erect branching shrub up to 3ft. tall. **Leaves**—Narrow, oblong to oblanceolate, about 3in. long, obtuse to subacute, wavy, glabrous. **Flowers**—Solitary or few together, white, about ½in. in diameter. **Fruit**—Globular, scarlet berries about ½in. in diameter, remaining for a long time on the plant. (Tropical America.)

Habitat: Damaged forest.

Distribution: Occasional to locally plentiful in several localities in North Island. Often cultivated.

General: Jerusalem cherry has not been responsible for any known poisonings among stock in New Zealand but has been suspected of poisoning cattle in Australia. The fruits have been responsible for deaths and sickness in human beings. Because of the presence of toxic alkaloids in the plant, poisonings could occur if quantities of it were ingested.

Poisonous principle: The alkaloid solanocapsine is present throughout the plant. This alkaloid causes irritation and has a direct slowing effect on the heart.

Fig. 20—Potato (*Solanum tuberosum*). A: Habit. B: Flowers. C: Berries.

Potatoes. *Solanum tuberosum* **L. (Fig. 20)**

General: Sprouted or greened potatoes have long been recognised as dangerous fodder for stock consumption, cattle, horses, and poultry having been poisoned as a result of eating potatoes in this condition. The green haulms of the potato plant are also known to produce deleterious effects on cattle which have eaten them; decaying or ensiled haulms appear to be fed with no ill effects. Potatoes which have not been properly earthed up may become greened through exposure to sunlight; the resultant crop is then poisonous to man, as has been shown in New Zealand and other parts of the world. Raw potato peelings have been responsible for sickness and, possibly in one case, death. An inflammatory condition of the skin, termed potato eruption, is reported in pigs, cattle, and horses which have eaten large quantities of raw or cooked potato tubers or leaves, or kitchen refuse which included potatoes in either form. According to the authors, this condition is more prevalent in spring. The causal agent of potato eruption is incompletely understood. The quantity necessary to produce the condition varies with the class of stock and the time of the year. This condition is not known to occur in New Zealand.

Symptoms of poisoning: Symptoms in pigs are not diagnostic; they include marked dullness, copious diarrhoea, and regurgitation of stomach contents. Cattle show weakness, dilation of the pupils, trembling, and frothing at the mouth, followed by death. Affected human beings suffer from headache, nausea, emesis, gastritis, and, if large doses have been absorbed, nephritis, haemoglobinuria, and central nervous paralysis. The toxin also has a local irritant action and could cause gastroenteritis.

Potato eruption is accompanied by rise in temperature, loss of appetite, retarded defaecation, salivation, and weeping, which precede the vesicular inflammation of the skin of the lower parts of the limbs. Rupture of the vesicles produces a moist, red surface. In a few days crusts are formed on the ruptured surface. Prolonged feeding increases the size of the affected area; ulceration may set in. Severe diarrhoea and weakness may be associated symptoms. Death may follow. Gastroenteritis is a post-mortem examination symptom.

Poisonous principle: The toxin present in greened and sprouting potatoes is solanine, a glycosidal alkaloid. (See also *Solanum dulcamara* on preceding page.)

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Auckland Loganberry Garden

ALTHOUGH strawberries are the only small fruits grown extensively in the Auckland district, a few small areas of loganberries and boysenberries have shown that these may also be produced commercially. That loganberries can be grown successfully has been demonstrated by Mr. A. C. Paice, of Avondale South, and in this article W. S. Kemp, Orchard Instructor, Department of Agriculture, Alexandra, describes the methods used.

[*Sparrow Industrial Pictures Ltd. photo.*
Portion of the main block with pickers at work.

FOR small fruits such as loganberries a fertile, well-drained soil is desirable. Mr. Paice's property contained sufficient land for the project, but it consists of heavy clay soil and is far from ideal. The chief factors in its favour are its closeness to Auckland City and its gently sloping northerly aspect.

The land, which previously had been used for growing strawberries, lacked suitable shelter for loganberries. The only established shelter consisted of a macrocarpa hedge which had been planted on the south and west sides of the ½-acre house section and was then about 10 years old. Only a small area could be planted inside this shelter, the bulk of the garden having to be established on the south of the existing shelter. It was therefore decided to subdivide the area into small blocks of about 1½ acres with macrocarpa hedges and to plant both the macrocarpa and loganberry plants at the same time.

About 1½ acres of loganberry vines were planted in the spring of 1944, and in 1946 the planting was increased by ¾ acre.

Spacings Inadequate

The vines were planted 4ft. 6in. apart in rows 9ft. apart. The headlands were approximately 15ft. wide. In the first area the distance between the parallel rows of shelter and vines was 10ft., but in the second planting this distance was increased to 14ft. and the northern headland was increased to a width of 25ft. to allow for a roadway into the packing shed.

These spacings, especially the distance between vines, have proved to be too close. The space between the vines for training the canes on the fences is inadequate and they become entangled, making pruning, training, disease control, and harvesting more difficult. There is insufficient area of ground for full root development of each vine, and in those rows next to the shelter there is strong root competition with the macrocarpa. By the use of very heavy applications of fertiliser these disadvantages have been partially overcome. The removal of alternate vines so that the space between them was increased to 9ft. would be beneficial.

Mr. Paice considers that with present-day labour shortages the area in loganberries, about 2½ acres, is too great and that boysenberries would have proved better for the second planting, as boysenberries mature a little later and picking and marketing difficulties would have been reduced considerably.

[*Sparrow Industrial Pictures Ltd. photo.*
Method adopted for training the vines.

Excellent Shelter

Although the macrocarpa shelter was planted at the same time as the vines, constant cultivation and manuring have encouraged rapid growth and excellent shelter is now provided. The vines also have received constant attention to cultural details and have responded accordingly. The winter following planting they were ready to be put on the fences for the first time. A small crop was harvested that season (1945), but no substantial quantities of fruit were picked until the third summer after planting. Since then the crop has increased each year.

[*Sparrow Industrial Pictures Ltd. photos.*

Left—A chip of loganberries. Right—A half crate ready for lidding and dispatch to market.

Training of Vines

The vines are trained on fences of wooden posts approximately 4in. x 4in. and 6ft. long set 4ft. 6in. out of the ground and carrying 3 wires. At the ends of rows heavier, approximately 6in. x 6in., and slightly longer posts are used, set well into the ground and anchored with stays. The first wire is placed about 2ft. from the ground with about 12in. spacings between the other wires. In the first area established a fourth wire has been added at the top. This was done by nailing short pieces of 2in. x 1in. timber to posts so that they project about 9in. above the posts, and the wires are laid along the top of them. Although wooden posts were used, it would appear that a more permanent material is desirable.

Cultivation and Pruning

Mechanical equipment for cultivation consists of a 3 h.p. mechanical cultivator which is used solely for ploughing and a 5 h.p. rotary hoe which is used for summer cultivation. Hoeing between the plants is done by hand several times during the year to suppress weed growth.

Each year light ploughing, in which the furrows are turned outward toward the vines, is carried out as soon as the canes are put up on the fences. This leaves open furrows down centres of rows, which facilitates draining of excess water. Care is also taken that no hollows are left undrained to hold water and cause roots to become waterlogged.

Rotary hoe cultivation is done during summer as often as is necessary to control weed growth and maintain a good surface tilth which will conserve moisture. At no time is the ground cultivated deeply, as the loganberry is a surface-rooting plant.

Pruning is done as soon as the crop is harvested, usually during the latter half of January. All vines which have fruited are cut out and taken off the area to be burnt in order to destroy any disease with which they may be infected.

The canes are put up on the fences in June each year. The number of fruiting canes retained each year is not limited, all good ripe canes being left. The rope method of twisting one or more canes, depending on the total number of canes to the vine, around each wire is used. This method is adopted primarily because it is quicker than the loop system, which consists of looping the vines around all 4 wires and tying the ends. As there is only a short period during which vines can be put up without damaging them excessively, time is important. The loop system of training would be better from a cultural aspect, because the maximum fruiting surface would be exposed to the sunlight, disease control and harvesting would be made easier, and there would also be less chance of restricting the opening of buds than is the case when several canes are twisted around one wire.

Each year as the young canes grow they are pegged back along the ground beneath the fruiting canes with pegs made from No. 8 wire. This reduces damage during cultivation and harvesting operations. Care of the new canes is most important, as it is upon these that the following season's crop is produced.

Adequate Moisture Essential

Adequate soil moisture is most necessary when the berries are maturing and during periods of drought. Several methods of irrigation have been tried, adequate water usually being available. The sprinkler system was tried, but it caused scorching of the berries and had to be discontinued in favour of irrigation by allowing the water to run down the gentle slope of each row. Sawdust mulch applied on a small area was very effective, but it was considered too costly.

Spraying

Disease control has always been good. Spraying has been done with a knapsack sprayer, but its capacity is too small for the work required of it. Although the garden has been kept very free from disease, it has involved a great deal of hard work and taken up time which could have been used to better advantage. It is intended to install a power sprayer when a small economical machine of suitable capacity is available.

The disease control programme last season consisted of three sprays only. The first was a 5 : 4 : 50 Bordeaux plus 50 per cent. D.D.T. powder at the rate of 1lb. to the 100 gallons of water applied at early bud movement just after finishing putting up the vines in June; the other two sprays were D.D.T. only, at the same strengths, the first early in August and the second early in September, just before the flower buds opened.

Caterpillars, which attack the berries, and cane spot (*Elsinoe veneta*) are the two most serious troubles for which control measures are necessary.

Harvesting

In most seasons harvesting begins early in November and picking continues for about 9 weeks. In the flush of the season as many as 24 pickers are required to harvest the fruit at the right stage of maturity. All picking is done on a contract basis. The fruit is picked straight into 1lb. chips or punnets ready for marketing. The chips are covered with transparent cellulose and packed in crates holding 8 or 16 chips. The bulk of the fruit is sold in Auckland City.

Last season part of the crop was sold to a factory for pulping, but it is intended in the future to try 6 and 12lb. tins as well as the small chips as a means of marketing the fruit and increasing the domestic consumption for jam and preserving purposes.

Full production has probably not yet been reached, especially in the area planted out in 1946. Yield per acre has been up to 3 tons, but this figure is above average for the district and has been attained only by very heavy fertiliser applications, adequate attention to cultivation, spraying, and general care of the vines, and use of irrigation during dry periods.

Responses to Pasture Topdressing in Tauranga County

By A. V. ALLO, Instructor in Agriculture, Department of Agriculture, Tauranga

ONE of the most striking features of New Zealand farming over the past decade has been the increasing interest shown by farmers in their pastures, particularly in pasture topdressing. For many years the Department of Agriculture has been conducting pasture topdressing trials throughout New Zealand and as a result it is now in a position to advise a farmer what fertiliser or combination of fertilisers will give best results on his farm. This survey is based on the results of pasture topdressing trials conducted over the past 20 years in Tauranga County.

TAURANGA COUNTY, situated on the coast of the Bay of Plenty, extends from the Athenree Gorge in the north-west to the Otamarakau valley in the south-east, and is bounded inland by the Kaimai Range. The county is roughly 70 miles long and its width varies from 8 to 30 miles.

With the exception of a large area of swamp country in the Te Puke district, the area generally is undulating to hilly, with gently rolling country near the coast rising inland to a series of low hills. A characteristic feature of the landscape in the Tauranga and Te Puke districts is the series of steep, parallel gorges, which run roughly at right-angles to the sea coast. These gorges are 100 to 200ft. deep and about 200yds. wide and abruptly break the country into a series of plateaux, on which farming operations are carried out. Near the coast the gorges widen out into valleys which ultimately merge with the rolling coastal country.

Although most of the country near the coast is occupied and has been more or less developed, much of the steeper hinterland is covered with fern and scrub; there are large areas of bush inland and along the tops of the Kaimai Range.

Initial development of the county was slow compared to that in many other parts of New Zealand, partly because of difficulties of access, but mainly because more than half the county was affected with bush sickness, which made sheep farming impossible and the rearing of healthy young dairy stock extremely difficult. Once the treatment for bush sickness was discovered in the early 1930's farming forged ahead on the bush-sick areas, which were otherwise ideally suited for grassland farming.

Dairying Major Activity

The major agricultural activity of the county is dairying—there are over 1100 holdings on which nearly 53,000 cows are milked—which is only to be expected in view of the ideal climatic and soil conditions, and it is reasonable to assume that dairying will always be of paramount importance. The bulk of the dairy production comes from the lower undulating country and drained swamps, although many dairy farms, some with excellent production figures, are found inland on the higher country.

Farming land in the Omokoroa district.

Increase in Sheep Population

Over the past few years there has been a marked increase in the sheep population of the county, with fat-lamb production the main activity and the fattening of beef cattle an important adjunct. The spread of ragwort on much of the hill country and inland areas between 1930 and 1940 forced many farmers to go wholly or partly out of dairying into sheep, while the introduction of cobalt topdressing as a remedy for bush sickness made sheep farming possible on areas on which sheep could not previously be run. During the war the shortage of farm labour was responsible for many farmers changing over from dairying to sheep, either wholly or partly. In general, however, the tendency is to run sheep and cattle with possibly dairy cows as a sideline on the hillier inland country, and to run dairy cattle on the easier coastal country.

Soils

Most of the soils of Tauranga County are pumiceous in origin, having been influenced by one or more of the ash showers that have played an important part in shaping the agricultural destiny of much of the North Island. The two major ash showers associated with Tauranga County are the Kaharoa and Waihi showers, the former covering the country east of Tauranga Borough and the latter the western half of the county. These two showers have given rise to two distinct groups of soil types; there is a third type, the swamp country of the county.

All the pumice country irrespective of the ash-shower group to which it belongs has certain well-defined characteristics. The soil is light and open in texture, naturally deficient in phosphates and organic matter, but free working and well drained. It never pugs up and can be worked even after heavy rains. It warms up quickly in spring, but dries out even in a comparatively short dry spell. Its light texture makes consolidation a most important factor in pasture establishment and many failures in newly sown grass on this country are directly attributable to seed being sown on a loose seed-bed.

Pumice soils are readily wind blown and fairly severe wind erosion has been seen, but once the country is in pasture it is relatively stable. The pumice soils of Tauranga County are ideally suited to grassland farming, both for sheep and dairy production, and the future prospects of farming in the county are most promising.

Waihi Ash Soils

The soils derived from the Waihi ash shower are in the western portion of the county. They extend from the Whakamarama hill country to the county boundary at Athenree and include all the points jutting into Tauranga harbour.

Although there are several minor variations of soil type within the Waihi ash shower, the responses to topdressing in trials have been relatively consistent over the whole area and it is not necessary to consider these minor variations in detail.

The black topsoil which characterises the coastal points varies in depth from 8 to 14in. and is the most fertile in the area. On it are some of the best farms in the county. It is largely devoted to dairying and fruit production. During the past 10 years a number of farms on these coastal points, particularly those near Tauranga, have been cut up into smaller holdings, mostly for the production of fruit.

Inland the black topsoil becomes shallower, until in the hill country, the topsoil is a brownish type of sandy loam varying in depth from 4 to 6in.

There is fairly marked variation in the type of pasture on the coast and in the hills. The former is characterised by a strong paspalum growth with which is mixed ryegrass, white clover, and minor associated species such as cocksfoot, red clover, and crested dogstail. On poorly managed pastures

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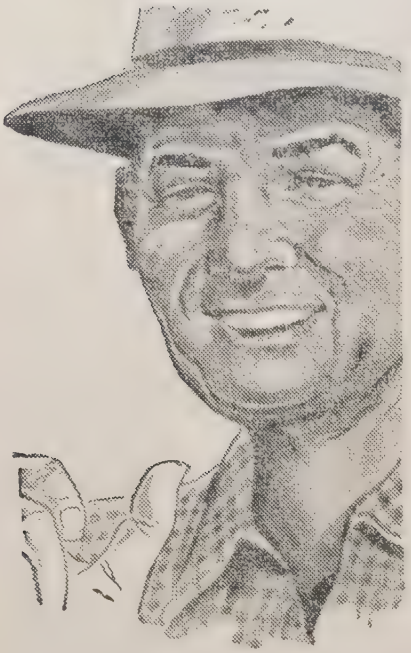

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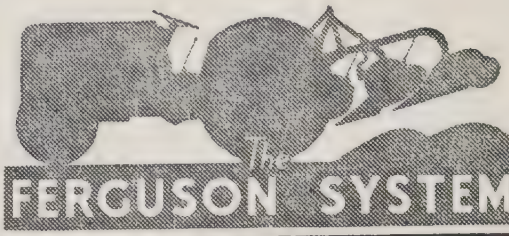

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paspalum assumes such dominance that other species are suppressed and total pasture production is low. On the better-farmed areas, however, there is a good balance between paspalum and associated species, and a highly productive pasture is the result.

In the higher country paspalum is not so prominent, except on some of the older-established areas, and the pastures tend more toward a ryegrass, white clover, and cocksfoot association, with paspalum, red clover, and crested dogstail as minor sward constituents. Even on this higher country, however, good management and adequate topdressing will result in pastures capable of producing over 200lb. of butterfat per acre.

Dairying is the main type of farming on the Waihi ash country, particularly on the coastal points and lower undulating country. In the hills the tendency is to run sheep, mainly to control ragwort, with the dairy herd. In the area there are also a number of sheep farms producing good crops of fat lambs.

Most of the coastal country has now been developed, but there are still large blocks of the hillier country awaiting development and carrying at present a covering of bush, scrub, and fern. Much of this country is of good quality and capable when developed of carrying a cow to 2 acres; most of the balance is good sheep country. There has been a considerable area of this hilly country brought into production over the past 10 years and some good pastures can be seen on land that was in fern and scrub only a few years ago.

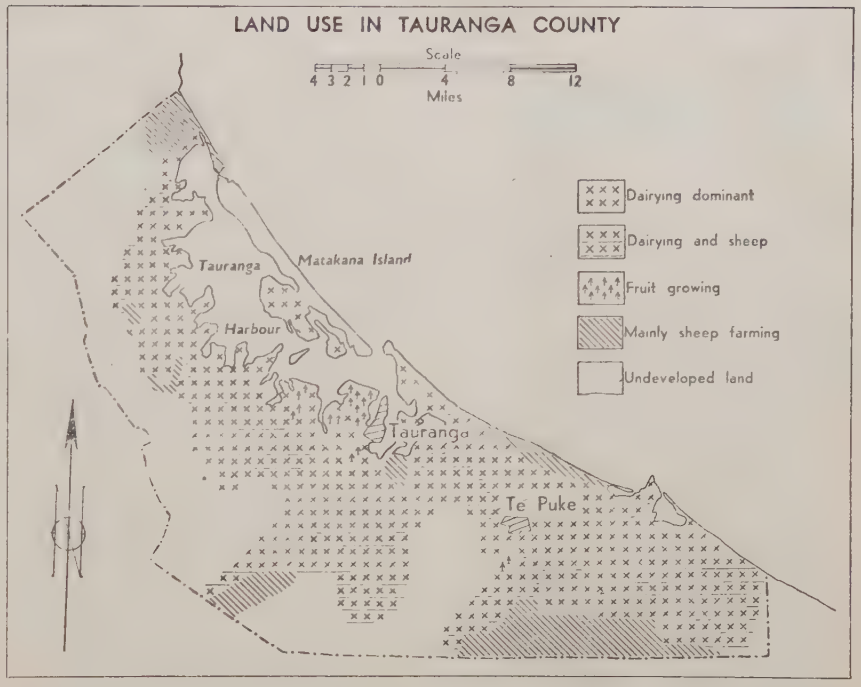
Kaharoa Ash Soils

The soils derived from the Kaharoa ash shower cover the eastern portion of the county, excluding the swamp areas, and extend from Whakamarama through the Kaimai Range down to the county boundary at Otamarakau. There are several minor variations in soil type, such as are found in the Waihi ash country, but they are of minor importance when considering responses to pasture topdressing.

Kaharoa ash soils are all cobalt deficient to a greater or less degree and all require cobalt topdressing before healthy stock can be reared.

The topsoil of these Kaharoa ash soils varies in colour from blackish-brown to brown and is similar in appearance to soils of the Waihi ash group. Kaharoa ash soils respond very well to good farming practices and there are many highly productive farms on these soils, particularly in the Te Puke district. The pasture types vary from good paspalum, ryegrass, and white clover swards on the higher-producing farms to ryegrass, white, red, and subterranean clover, crested dogstail, and cocksfoot on the hillier and more recently developed country in the hinterland.

Most of the easier country is devoted to dairy farming, with sheep being run for ragwort control on many of the larger units. There are also some high-producing fat-lamb farms on this country, particularly in the Paengaroa district. Further inland, though dairying is the most important farming operation, the number of sheep has increased greatly, particularly in the last 10 years.



Swamp Soil

The third major soil type found in the county is the peaty loam of the swamp country. The largest single area is in the Te Puke district in the swamp country extending from Papamoa to Maketu. There are many smaller patches of swamp country in the western half of the county in the valleys at the head of the inlets between the coastal points and in some inland valleys and gorge bottoms.

Drainage of this swamp country is difficult in many cases. The smaller swamps in the western portion of the county have a relatively large area of surrounding hill country acting as a watershed, and the cost per acre of the drainage necessary to cope with this run-off is considerable. In the Te Puke district the drainage of swamp country is complicated by the Kaituna River, which meanders over the area and is responsible for considerable damage when it floods periodically. It is widely accepted that any general drainage scheme for this area is bound up with the control of the Kaituna River, and at present drainage engineers are working on a scheme to control it.

Much of the swamp area has been drained and is carrying pastures dominantly paspalum with, in many cases, a good mixture of ryegrass and white clover.

Unfortunately, much of this ground contains timber, the removal of which is costly. Even after the land has been stumped and levelled for pasture it is not long before a fresh crop of stumps comes to the surface and the ground has to be restumped.

Pasture Topdressing Trials

Although there have been various alterations in size and general layout over the past 20 years, the observational topdressing trials conducted by the Department of Agriculture have consisted essentially of measured plots on which a known quantity of fertiliser is applied each year. Care is taken to select a farm on a soil type typical of the district under investigation, and, wherever possible, a grazing pasture is selected in preference to one regularly cut for hay or silage. The topdressing plots are laid down on a portion of the paddock away from fences, hedges, tracks, etc., and as even a sward as possible is selected. As it is recognised that clovers are the major plants to indicate fertiliser responses, care is taken to see that there are adequate clovers in the field selected for the trial. Finally, as much information as possible is collected on the past management of the field, particularly the topdressing history. All plots are laid down in duplicate so that they can be a check on each other.

One of the early topdressing trials laid down by the Department consisted of 4 plots each 20 x 20 links, topdressed as follows:—

1. No manure.

2. Superphosphate, 3cwt. per acre.

3. Superphosphate, 3cwt. per acre, plus 30 per cent. potash salts, 2cwt. per acre.

4. 30 per cent. potash salts, 2cwt. per acre.

Half of each of these plots was limed at the rate of from 5 to 20 cwt. per acre, depending on the type of soil and the probability of a lime response.

These plots were usually topdressed yearly, the trials being conducted for at least 3 years.

Later layouts were modified to suit new requirements. Farmers were no longer content to ask if their land required phosphates; they wanted to know what were the most efficient phosphates and the rates to apply phosphates, potash, and lime. Consequently the number of individual treatments was increased to include

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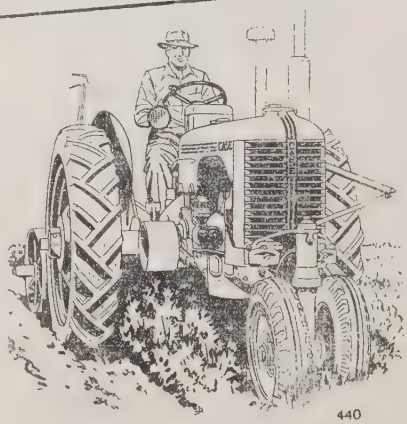

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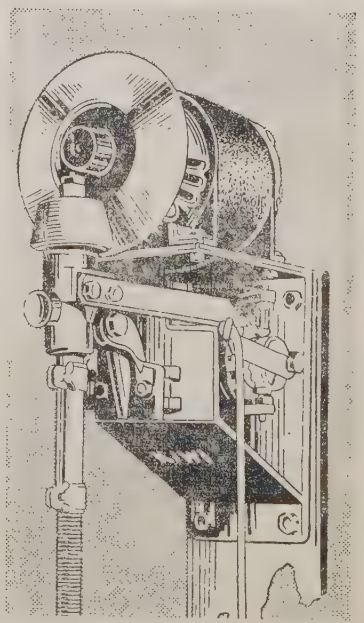

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most of the common phosphatic fertilisers. The general layout tended to become increasingly complex, but a greater amount of information was obtained.

The trials were visited by local Instructors of the Department every 3 months and careful observations were made of any responses to various manurial treatments. For uniformity a scale of points was used in which the no-manure or control plot was 0 and a marking of from 0 to 5 points was given to each plot according to the degree of response (1 point, slight response; 2, fair response; 3, good response; 4, very good response; 5, excellent response).

The marking for each plot was amplified by brief notes describing the nature of the response, which was usually seen in improved clover content and growth, better grass quality and growth, improved vigour, or increased palatability.

It was not very long before farmers began to profit from the information gained from these trials. Topdressing was no longer a "hit-or-miss" business and a farmer could order the fertiliser best suited for his own particular soil type.

A number of topdressing trials have been carried on for 15 years in Tauranga County and the table on the next page indicates the results obtained.

The table shows that the principal factor limiting pasture production on all soil types in the county is phosphate deficiency and poor, if any, response can be expected from any other type of fertiliser unless supplies of phosphate in the soil can be built up to a satisfactory level. Another series of topdressing trials laid down throughout the county has in 12 months given results similar to those shown in the table with even more marked potash responses in most cases. The new trials have not been included in the list of experiments owing to the short time they have been laid down. It should also be noted from the table that application of potash alone gave little or no response. This illustrates that it is useless to apply potash to the soil unless the phosphate content is satisfactory.

The best responses have been obtained when potash and phosphates have been used together. The responses from lime are not consistent, and it is evident that heavy lime dressings are not required in this district.

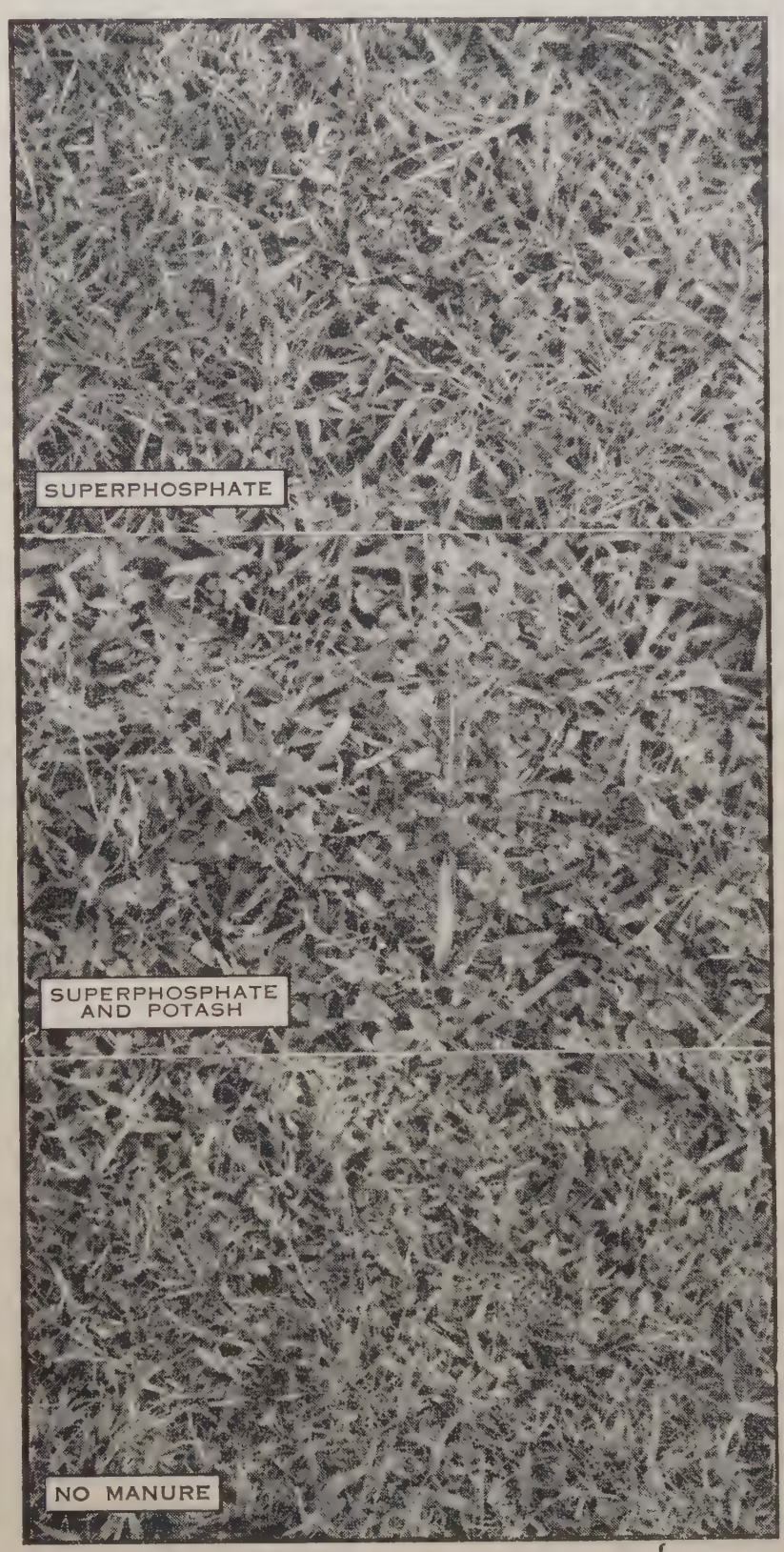
Soil samples from a number of the experiments have been analysed and a reasonable agreement was shown between laboratory analyses and results obtained in the field.

It is not sufficient to know that phosphates or potash will give a good response. It is also necessary to ascertain if the response is payable, what are the optimum rates of application, and what are the most efficient types of fertiliser to use.

Payability of Responses

It is not disputed that it is economic to topdress soils of Tauranga County with phosphates. Experiments conducted by the Department and practical farming experience show that it is impossible to maintain adequate pasture growth unless regular phosphatic

Pasture cover on Oropi sandy loam (soils derived from Kaharoa ash), topdressed and not topdressed:—



topdressings are applied. Farmers' experiences during the war, especially on the more recently developed country, when fertiliser supplies were heavily rationed gave further proof of the need for phosphatic topdressing.

Need for Potash

The soils of Tauranga County are showing an increasing need for potash. Potash responses have been obtained on all soil types and are showing up today on country which did not respond to potash 10 years ago. The time is not far distant when the Tauranga farmer will have to apply potash regularly if he wishes to maintain pastures in good heart. Even today there are many instances of farmers who are obtaining a payable response from the use of potash. Though the present price of potash is high, it must be remembered that if only a slight response to the use of this fertiliser is visible, such a response will probably give a good profit.

One of the first indications of potash deficiency is a weakening of white clover and a general unthriftiness in the sward. Though these are often due to other factors totally unconnected with manurial deficiencies of the soil, it would still pay a farmer on this country to suspect potash deficiency whenever the above symptoms begin to show. They appear most rapidly on pastures cut frequently for hay or silage and some excellent potash responses have been obtained from pastures of this type. It would well repay any farmer in Tauranga County to experiment with potash for himself, particularly on some of his poorer pastures and on hay paddocks. Seldom has potash response been obtained on a night paddock.

In the past the general opinion has been that lime is not necessary on the pumice country. Though this may be true in so far as it is not advisable to apply lime until the major deficiencies, which are phosphate and potash, have been satisfied, the judgment is too sweeping. The position regarding the use of lime in Tauranga County would appear to be as follows:—

On new country where finance is seriously limited a farmer should make sure of giving his land adequate dressings of phosphates and, if necessary, potash. This should make first call on money spent on fertilisers. When these fertilisers have been applied consideration should be given to using lime. Over 50 per cent. of the experiments listed on this page indicated a response to lime at some time in their history. The response was not marked or continuous, but it is still considered advisable to use some lime, particularly on the longer developed country. Heavy dressings, however, are not indicated.

RESPONSES IN PASTURE TOPDRESSING TRIALS IN TAURANGA COUNTY

District	Soil	Lime	Phosphate	Potash	Lime and phosphate	Phosphate and potash	Lime, phosphate, and potash
					Points		
Soils derived from Waihi ash							
Athenree hill country	Katikati sandy loam	—	2¼	—	2¼	3¼	3¾*
Takawai		—	2	½	2	3	3
Main Road, Katikati		—	3	—	3	3	3*
Main Road, Katikati		—	2½	—	2½	3½	3½*
Henry's Road, Katikati		—	1	—	1	1½	1½
Upper Henry's Road, Katikati		—	2½	—	2½	3¾	3¾
Wharawhara Road, Katikati		—	1	—	1	4	4
Lund's Road, Katikati		—	1½	—	1½	3¼	3¼*
Matahui, Aongatete	Katikati sandy loam (black phase)	—	2	—	2	2	2*
Omokoroa		—	2½	—	2½	2½	2½
Te Puna		—	2	—	2	2¾	2¾*
Te Puna		—	2¼	—	2¼	3	3*
Woodlands, Katikati	Waitekauri sandy loam	—	2½	¼	2½	3¾	3¾
Aongatete	Te Manaia sandy loam	—	2	—	2	3	3
Aongatete		—	3	—	3	4	4*
Aongatete		—	2½	—	2½	4	4
Soils derived from Kaharoa ash							
Omanawa	Oropi medium loam	—	2	—	2	3½	4½
Pyes Pa		—	2	†	2	2½	2½
Oropi		—	3½	—	3½	3½	3½*
Papamoa Hills		—	3	—	3	3	3
No. 3 Road, Te Puke		—	2	—	2½	3	3¼
Lower Te Matai Road, Te Puke	Paengaroa medium sand	—	2½	—	3½	(no potash used)	
Rangiuru		—	3	—	3	3	3*
Otamarakau		—	2	—	2	2	2
Peat soils							
Papamoa swamp	Pongakawa peaty loam	—	1	—	1	3½	3½*
Pukehina swamp		—	1	—	1	1½	1½
Soils from coastal sands							
Kairua	Coastal sand	†	2	—	2	2½	2½*

* In these trials there was an indication of a lime response at some time during the trial, though the response was not sustained.

† Possible response.

Rates of Application

It must be remembered that virgin country in Tauranga County is very deficient in phosphates, which must be applied in adequate quantities to promote the clover growth so essential for adequate pasture production. It has been found that the ideal dressing for new grass on new country is 3cwt. of phosphate per acre at laying down, 3cwt. in the following spring, and a further 3cwt. in the following autumn —9cwt. in the first 12 months. If blood and bone is available, a good initial dressing for new grass on virgin country is 2cwt. of serpentine superphosphate plus 2cwt. of blood and bone per acre, followed by 3cwt. of serpentine superphosphate in the following spring. On established older pastures the annual dressing should be between 3 and 4cwt. of phosphate, applied in autumn, or if it is to be applied in two dressings, in spring and autumn. Hay and silage paddocks could have an additional dressing of 2cwt. of serpentine superphosphate in spring when they are closed up. Where the soil is very low in potash the initial dressing should be 1cwt. of muriate of potash per acre in autumn, followed by annual dressings of ½cwt. per acre. When potash deficiency is less marked, annual dressings of ¼cwt. per acre should suffice. When farmers are testing potash for themselves they are advised to topdress strips down their paddocks with potash at rates of at least 1cwt. per acre. It is always of value to leave a small strip in the centre of the paddock untreated with potash so that a farmer can see the degree of response. If 30 per cent. potash salts are used instead of muriate of potash, 2cwt. of the former should be used in place of 1cwt. of the latter.

It is not necessary to apply lime in heavy dressings in Tauranga County, except on some of the inland swampy areas near Tauranga where soil tests have revealed on some of the peaty loam country that lime in rates of 1 ton per acre could be applied with advantage. Elsewhere, it is suggested that lime be applied at the rate of 5 to 8cwt. per acre every 3 years.

Types of Phosphate

Experiments have indicated that serpentine superphosphate and superphosphate are the most efficient phosphates in Tauranga County. There has been little to choose between these two fertilisers.

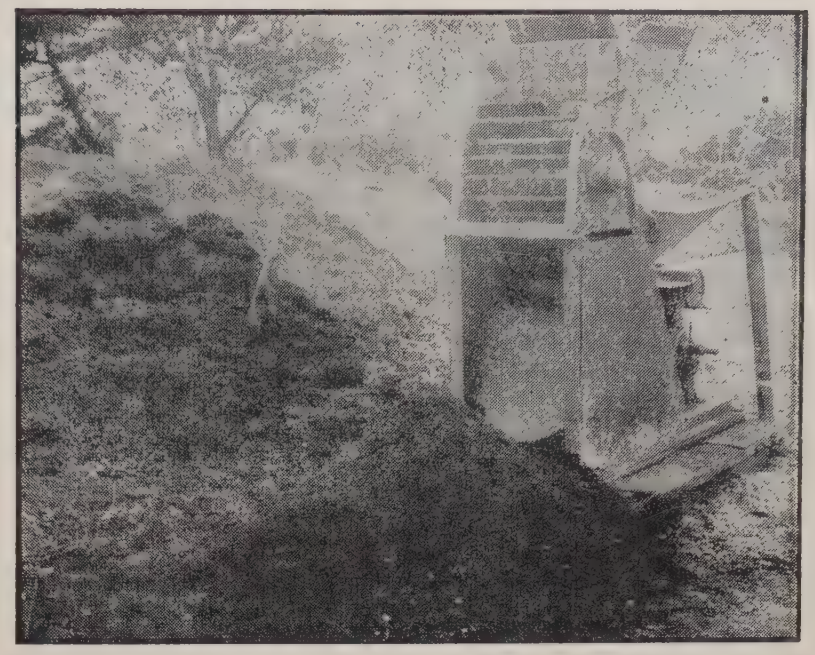
Careful trials with the slower-acting types of phosphate indicate that they will not give the same response as obtained from superphosphate and serpentine superphosphate and their use is not generally recommended.

On the soils affected by the Kaharoa ash shower cobaltised fertiliser should be used. It is not necessary to apply 3cwt. of cobaltised fertiliser per acre yearly, but at least 1cwt. of cobaltised manure mixed with uncobaltised fertiliser should be applied per acre yearly. Another method is to topdress the farm with all cobaltised fertiliser every 2 or 3 years and use uncobaltised fertiliser in other years.

Large-scale Composting

By J. T. McCONACHIE,
Horticultural Inspector, Department of Agriculture, Auckland

IT has long been recognised that in any system of intensive cropping over an extended period the first essential is to maintain the fertility of the soil. Now that motorised transport and methods of cultivation have largely displaced horses the large supplies of stable manure formerly available for addition to cropping areas no longer exist. The shortage of organic fertilisers during and since the war has further accentuated the need for alternative methods of maintaining fertility. During recent years, however, increased attention has been focused upon the use of waste organic materials by a process of composting, which converts them into a product possessing manurial value and applications of which have proved to be an excellent means of restoring fertility to worn-out soils.



[*Sparrow Industrial Pictures Ltd. photo.*

Matured compost pulverised by the grinder into a condition suitable for bagging and easy application.

WELL-MADE compost is a carefully prepared product, resulting from a combination of animal and vegetable wastes being held together in more or less definite proportions for a defined period while control is kept over the fermentation process that ensues.

A municipal composting scheme was initiated in 1946 by the Dannevirke Borough Council, by which abattoir and slaughterhouse wastes, garbage from fish shops, hotels, and boarding houses, roadside grass and cleanings, general town refuse, sewage sludge and effluent, sawdust, and wood shavings are successfully composted and produce an organic product sought by orchardists and gardeners in the Hawkes Bay district.

Auckland Project

For some years before the Dannevirke scheme was properly under way a large-scale composting plant for the utilisation of materials wholly organic in origin was already in existence in New Zealand, the only difference being the types of materials employed. In 1943, when organic fertilisers were in short supply, Mr. D. D. Gill, of Te Atatu, some 3 miles from Henderson, began the collection of a very small proportion of the organic waste products available in Auckland City and established a composting project.

That a wide range of organic materials can be successfully composted is shown by the following list of waste products now collected from various parts of Auckland City to form the basis of the project described in this article.

From breweries: Spent hops, sweepings from floors of malt houses, and used filter pads that are used in filtering liquor.

From flour mills: The variety of waste products is considerable and comprises the residue that remains after the processing of wheat and oats in the production of flour, oatmeal, bran, pollard, etc., together with used and damaged bags and sacks, cartons, and general floor sweepings.

From condiment and fruit-processing firms: Peanut husks and sweepings and the residue of ginger, cloves, garlic, tomato, and other vegetables after processing.

From coffee manufacturers: Spent coffee beans and chicory.

From fish merchants: Fish bones, heads, tails, and offal.

From sawmills: Sawdust and shavings from all classes of timber, both native and imported.

AFTER representations had been made to Parliament in 1946 by the New Zealand branch of the British Medical Association and other bodies requesting investigation into the utilisation of organic wastes a Government interdepartmental committee was formed. In an interim report prepared after hearing evidence the committee made suggestions about future investigational work. Among these were that one or more municipalities be encouraged to organise pilot plants for the composting of organic wastes, that arrangements be made for processes at the pilot plants to be studied experimentally, and that large-scale agricultural and horticultural trials with composted materials be arranged.

The Government accepted these recommendations and agreed to assist investigational work by the Auckland City Council and the Dannevirke Borough Council. Work is being undertaken at both centres to determine the most economical method of utilising town organic waste to make an effective economical material of high fertiliser value under New Zealand conditions.

The investigations will involve long-term experiments, but it is hoped that it will be possible for the Government interdepartmental committee to publish interim reports as knowledge is accumulated.

Until more is known it would be unwise to attempt to evaluate locally made composts, the composition of which varies enormously compared with other known fertilisers.

Handling Material

The method of composting adopted is similar in principle to that employed in the garden compost heap; the various types of materials are placed in a series of layers, the depth of which is regulated in accordance with the nature of the materials used. The more bulky and open-textured materials are placed in layers varying in depth from 12 to 18in., while those which are more compact and have a higher moisture content are placed in layers of 2in. or less deep.

Despite the huge quantities of materials used, every endeavour has been made to provide throughout the essential features necessary

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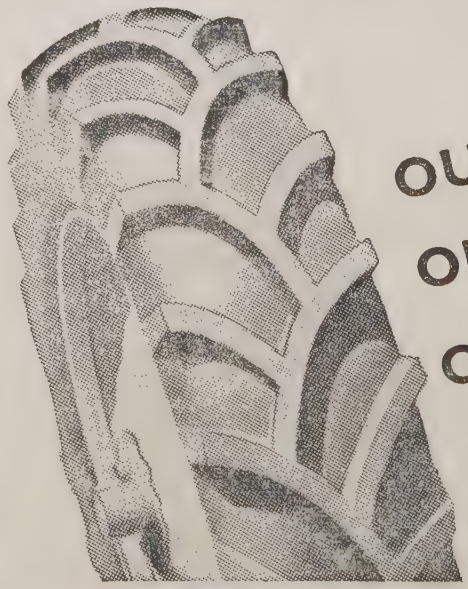

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for the successful functioning of the fungi and bacteria that work upon the materials used and in doing so transform them from their raw condition into one that, when applied to soils, becomes a first-rate source of humus in a suitable state for assimilation by plants. Essentials are air, moisture, and heat.

Air is provided by ensuring that bulky materials form the base of the heaps, and during the process of heap construction no pressure is applied that would restrict the movement of air throughout the materials. Upon the completion of heaps open vents are provided to allow the escape of gases that are generated during the process. Careful consideration is given to the order in which the various materials are used so that the correct moisture content is obtained in the heaps, as no suitable water supply is available for moistening dry materials as could be done with home garden compost heaps.

The combination of materials results in fermentation and this is accompanied by heat of varying degrees. It is now known that the many species of fungi and bacteria present in compost heaps require varying degrees of temperature for their development, some forms being present fairly early in the process of decomposition (when temperatures are highest), to be followed later by those existing during the later stages of decomposition, when temperatures are considerably lower.

First Heaps

The first heap was built on the ground after the turf had been removed and consisted solely of farm wastes comprising gorse, hedge clippings, stack bottoms, animal manure, and dead animals. This heap when completed was 60 cu. yds. The success of it led to the building of a second one, which was comprised of materials similar to those in the original heap with the addition of poultry manure and wastes from an Auckland brewery. The poultry manure was obtained from poultry farmers in the Henderson district, whose practice it was for many years to use straw as litter in their poultry houses. Within a few weeks this straw litter would become heavily impregnated with poultry manure, which, because of its nitrogen content, is recognised as an excellent form of manure. In recent years a considerable number of poultry keepers have substituted sawdust or wood shavings for straw.

[*Sparrow Industrial Pictures Ltd. photo*

Waste materials from flour mills being deposited in one of the pits.

The poultry manure when added to the heaps provided the activator which initiated the process of fermentation, with its accompanying rise in temperature, but it was noted that varying results were obtained, according to the nature of the litter used in the poultry houses. The strawy material proved a rather poor activator because it contained fewer poultry droppings and tended to pack down into a defined layer when other materials were added, thus impeding the free passage of air throughout the heaps. Although the sawdust litter was considered superior to the straw litter, best results were obtained when wood shavings had been used, as this material contained a higher content of poultry manure, having remained for a longer period in the poultry houses, and, because of its more open texture, it provided better aeration.

Demand for Compost

As the demand from home gardeners for the finished compost increased so did the size of the heaps built during 1944, and the range of waste products collected from the city was widened to include those from breweries, flour mills, sawmills, condiment factories, coffee manufacturers, and fish merchants.

Not all of these materials arrived at the composting site at one time, but because of their arrival and addition to the heaps in an order of regulated sequence, each one formed a defined layer and this order of application was maintained throughout until the heaps reached the desired size.

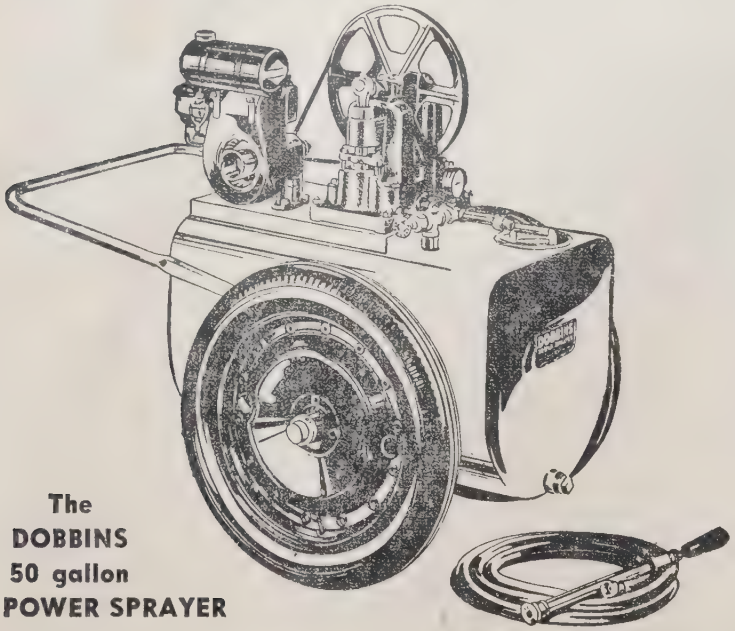
Gorse as Base

A feature of these heaps was gorse, obtained from roadsides and farm properties, some of the gorse having stood 15ft. high and with main stems as thick as a man's wrist. Gorse was used invariably to form the base of the heaps, having been placed to a depth of from 18in. to 2ft. to provide aeration to subsequent layers of materials, thus facilitating their decomposition. In forming the heaps care was taken to ensure that an even consistency of materials was maintained and dry materials such as sawdust and wheat and oat husks were applied immediately following additions of moist materials such as spent hops or the moist residues obtained from condiment and fruit-processing firms.

No soil has been applied to any of the heaps constructed to date. Because of the huge quantities of soil that would be required for compost heaps of the dimensions being built, it was impracticable to include soil in the list of materials used, but the omission of it was not considered to be of great significance owing to the wide range of other materials employed.

[*Sparrow Industrial Pictures Ltd. photo.*

The largest surface heap, which was 250ft. long, 30ft. wide, and 10ft. high when completed.



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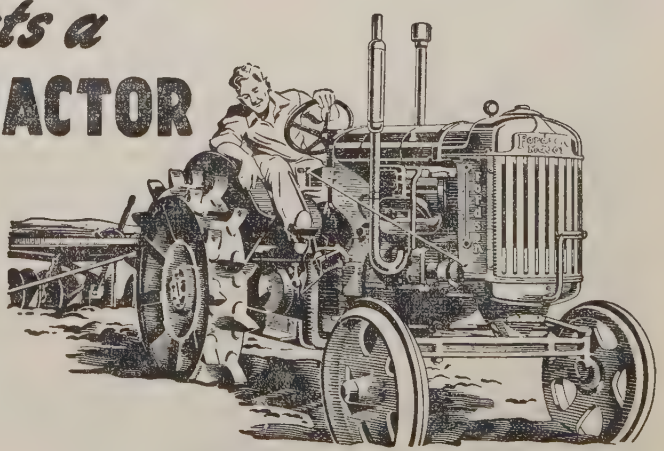

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The dimensions of the largest heap upon completion were 250ft. long, 30ft. wide, and 10ft. high. (This heap is shown in the lower illustration on page 523.)

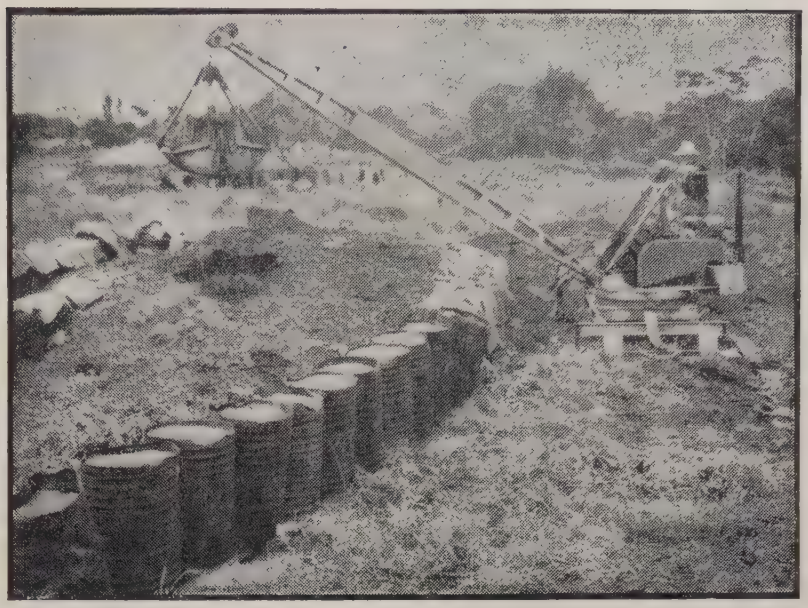
Experimental Use of Night-soil

During the course of construction of this heap 600 gallons of crude night-soil, which formed the collection made by a neighbouring local body, was added twice weekly for a period of 14 weeks during midsummer. Provision was made to prevent any fly nuisance or offensive odour arising from the use of this material by covering it immediately with a deep layer of sawdust or other similar wastes arriving daily from the city. The addition of night-soil was merely an experiment and was not continued after 14 weeks, as it was found impracticable to handle continuously the quantity arriving because of the inability to obtain, in the time available, sufficient quantities of sawdust or other suitable wastes to cover the night-soil satisfactorily.

It has been established that under normal conditions 1 cu. ft. of dry sawdust or similar material is required to absorb 1 gallon of night-soil satisfactorily for composting.

Trouble with Birds

In the greater part of the largest heap poultry manure was used as an activator and within a short period the temperature within the heap was raised to a condition favourable for bacterial development in the breaking-down process. As this process advanced and a lowering of temperatures took place large numbers of worms appeared in the heap, to which were then attracted sparrows and other birds which in their efforts to find worms broke down the top and sides of the heap to such an extent that some protection had to be given. For this purpose large gorse was spread over the top and sides of the heap, but the brush shelter proved only a temporary expedient. Because of this it was necessary later to introduce the pit system of composting which is now employed with great success.



[*Sparrow Industrial Pictures Ltd. photo.*

The compost crane in use.

Turning the Heaps

Within approximately 6 months from the time of completion of the heaps they reached the stage for turning and for this purpose a bulldozer was employed, but this method proved unsatisfactory, as it did not give the desired effect of permitting sufficient oxygen from the air to reach the bulk of the materials during turning, which is essential if the beneficial aerobic bacteria are to function successfully. Apart from turning, nothing was done to accelerate the maturing process, as time was not considered to be the major factor in the scheme, in which decomposition was allowed to operate naturally. (It is now the practice at some large-scale composting plants overseas to introduce into heaps herbal extracts or bacterial cultures that set up an accelerated rate of decomposition, thus considerably reducing the time for the composting process.)

However, within about another 3 months from the turning operation the compost had reached a condition suitable for sale and, as a means of pulverising it to bring it into a fine granular condition to facilitate handling, a 5 h.p. tractor with rotary plough attachment was used. This was done by operating the tractor along the sides of the heaps, throwing the compost outward, and eventually splitting each heap lengthwise into two heaps.

Pit Method

By the end of 1946 the impracticability for large-scale composting of heaps built on ground level, largely because of the difficulty of successfully maintaining the sides of the heaps and also because of the bird nuisance, was realised. It was at this stage that a change-over to the pit system was made.

The illustration at left shows the size of the first two pits formed, each being 150ft. long, 30ft. wide, and 7ft. deep. They were excavated by a bulldozer, and the spoil removed was

[*Sparrow Industrial Pictures Ltd. photo.*

The pits before filling was begun. Note the raised roadways formed between them.

used to form built-up roadways between pits. From these roadways the raw composting materials arriving by lorry are tipped directly into the pits. It will be seen from the illustration how the floors of the pits have been formed so that access to the centre of the heaps is provided from either end, the purpose of which is described later. Each of the two pits when completely filled above the level of the roadways holds approximately 1500 cu. yds. of compost.

A similar process of decomposition to that of the surface heaps has taken place within the pits, although it would have been accelerated had the contents been turned. Suitable machinery for this operation was not available until recently.

A third pit, 150ft. long, 40ft. wide, and 7ft. deep, was formed later. It holds approximately 2500 cu. yds. of compost. One of its notable ingredients is the garbage collected from householders in the New Lynn district, situated approximately 5 miles from Te Atatu. Approximately 10 cu. yds. of garbage is collected by the New Lynn Borough Council and is delivered to the composting pits twice weekly, but with the closer settlement now taking place in the district the quantity of garbage collected is rapidly increasing. The types of ingredients that form the collection are varied and comprise household garbage, floor sweepings, garden weeds, and wastes, old clothing and footwear, together with inert bodies unsuitable for composting. Tins, bottles, etc., have to be extracted by hand, and as these accumulate they are dumped well away from the composting site, as their presence in the compost would lead to damage to turning and grinding machinery.

The presence of foreign bodies in household garbage deserves consideration by those local bodies who make or intend to make collections of household garbage for composting. Householders also should remember that only materials of an organic nature are acceptable.

Unless careful attention is given to the provision of adequate covering of surface heaps, it is difficult to control evaporation, fly breeding, and other nuisances, and for this reason where large quantities of materials are employed the pit system of composting is superior to surface heaps.

Improved Method of Turning

In 1949 a mobile crane was purchased to turn the surface heaps and to load the mature compost on to lorries when bulk orders are supplied. During loading, turning, and unloading the compost is exposed to the air for a short time, thus permitting the oxygen in the air to enter it and stimulate the aerobic bacteria, which results in acceleration of the decomposition of the materials. For turning the compost in the pits the crane enters at one end of a pit and works with a half-circle movement progressively along the full length of the pit until all the contents are turned. The width of the pits (30 and 40ft.) allows operation of a turning crane within them. The pits may be entered from either end.

Pulverising Matured Compost

A grinder was purchased for pulverising the matured compost in preparation for bagging or distribution in bulk lots. The grinder is driven by a 10 h.p. petrol motor turning at 1750 revolutions per minute and consists of a series of revolving cutters which mills the compost into fine particles and throws it outward into a container from which it is bagged or loaded on to lorries.

To avoid having to fill the bags by the use of shovels, as at present, it is intended to fit an attachment to the grinder from which all bags will be filled directly; this will speed up the rate of filling considerably. Although it is recognised that dead animals form valuable ingredients in large compost heaps, trouble was experienced through the large animal bones clogging the jaws of the crane bucket and also the cutters of the grinder, and because of this only small dead animals are now placed in the pits.

Storage and Distribution

A large shed (30ft. long and 40ft. wide with 12ft. studs) with a 10ft. wide roadway down the centre has been erected for the storage of some of the matured compost. On both sides of the shed compost is stored as high as the roof, only sufficient space being reserved at one end for the grinder, which can be operated during fine or wet weather to keep a steady supply of finished compost on hand ready for distribution at short notice. The mature compost may be described as a friable, deep chocolate coloured, sweet-smelling earthy substance which when applied to soils aids considerably in keeping them in good heart. Compost should be considered of value more as a soil conditioner than as a fertiliser, which is always considered in terms of its chemical analysis. A few of the principal qualities of good compost are that following its use the general fertility of soils is increased, it assists cultivation because the mechanical and physical conditions of soils are improved, aeration and drainage are improved, and the moisture-holding capacity of soils is increased and soil erosion checked.

Essentials for Large-scale Composting

Considerable improvements could be made upon the present methods of large-scale composting. The essentials are:—

1. Necessity for planning the layout to suit the locality as well as quantity and types of materials to be used.

2. Mechanisation wherever possible.

3. Facilities for drying matured compost before pulverising and bagging it.

4. Provision of suitable buildings for storage of matured compost awaiting distribution.

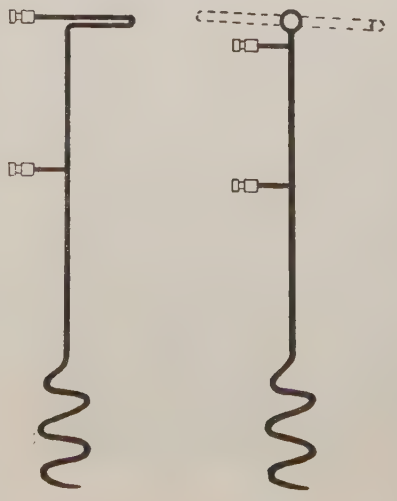
The composting system described clearly demonstrates how animal and vegetable wastes have been successfully employed to produce a product of value to the horticultural and farming industry. The principles of this project have been adopted by other individuals and a few local bodies for the composting of town wastes and garbage. As time proceeds and more suitable machinery is designed for this class of work greater improvements in methods of large-scale composting will, no doubt, be made.

Improving Grip of Electric Fence Standards

HANDY standards for taking electric fences over hollows or positions where ordinary standards would not hold can be made in either of the ways shown in the diagrams at right.

In both patterns a corkscrew end is twisted on a piece of ½in. or ⅜in. mild steel rod, in such a manner that will allow it to be screwed into the ground for the purpose of getting extra grip. In the left-hand standard the top of the rod is bent to act as a lever; in the standard on the right the top of the rod is made into an eyelet through which a piece of wood, piping, etc., can be inserted to give leverage.

—C. SARGENT, Te Puna



Ordering of Replacement Stock for the Household Poultry Flock

ARRANGING for the purchase of chickens or perching pullets is a task which the poultry keeper should set himself to carry out in good time. Apart from the inconvenience which can be caused at the hatchery, postponing ordering may place the buyer at a disadvantage. He may have to take late-hatched chicks, buy older pullets at a higher price, accept whatever birds are left, perhaps even culls, or go to a second-rate breeder because the best are booked out. In this month's article for the household poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, advises ordering replacement stock now after carefully working out what is needed.

TOO many buyers of poultry take what they are offered or what is advertised instead of studying their requirements and seeking to fulfil them. Some hatcheries specialise in day-old chick sales and do not cater for orders for perching pullets. Others will sell pullets of any age required, but some will quit them only at 6 weeks of age unless they are culls. Most newspaper advertisements offering perching pullets for sale quote a price for 6-week-old birds, but that does not prove that stage to be the best one at which to buy pullets.

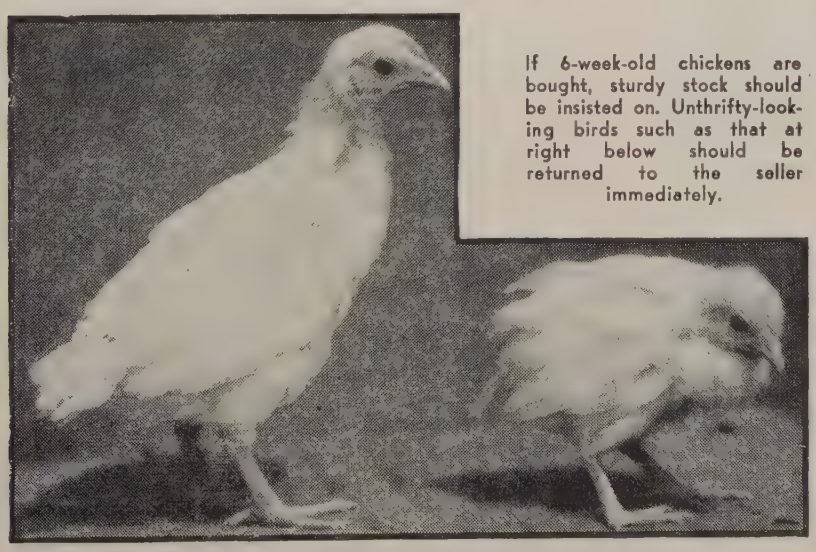
Three Stages of Poultry Keeping

The running of poultry may be divided into three major stages, with three different types of housing for these stages: The chick age, with the brooder house; the perching pullet age, with the colony-type rearing house; and maturity, with the laying house. A farmer making a feature of selling 6-week pullets wants to avoid the second stage, getting rid of the chickens from the brooder house without transferring them to a colony house on free range. This reduces work, saves expenditure on housing, cuts down the area needed for the farm, delays the time when the land will become "poultry sick", and reduces the danger of disease spreading on the farm.

These safegaurds would be in order if it were in the best interests of the buyer to accept delivery of pullets 6 weeks old. Too often the buyer does not realise that chickens straight from the brooder are not hardened off, and such birds can be affected severely by the change of housing, diet, and management. In some districts at some times of year heat may be turned off in the brooder house for a week or so before dispatch of the chickens, but they have been accustomed to sleeping with probably a couple of hundred mates, all supplying a little body heat to improve night temperatures. The buyer may have only 6 pullets, so night conditions are very different for the few.

[*Green and Hahn Photography Ltd. photo.*

Pullets are better bought at 8 rather than 6 weeks of age, as they are then perching and the difficult part of their rearing is over.



If 6-week-old chickens are bought, sturdy stock should be insisted on. Unthrifty-looking birds such as that at right below should be returned to the seller immediately.

[*National Publicity Studios photo.*

Now is the time for the household poultry keeper to order replacement stock, especially if day-old chicks are required.

Danger Period not Over

The poultry farmer may contend that the first 3 weeks of a chicken's life are the period in which infection and mortality are most likely, that the next 3 weeks are the second most dangerous period, and that after 6 weeks mortality risk is low. Unfortunately, especially under new and less experienced management, the danger period is not over. Apart from the fact that the birds have not been hardened off, the next 2 weeks have a critical effect on growth, stamina, and resistance to disease. The pullets can contract in their first few days of life a disease which may not show its effect for weeks or even months, so that the extra 2 weeks on the farm may not help them at all, but it may show its effect during that fortnight. Certainly, a conscientious farmer can cull and select 8-week-old chickens better than 6-week birds.

The best age at which to buy chickens depends mainly on individual circumstances — the accommodation available and the time and labour which can be spared. If the householder has suitable space for young chicks, is prepared to buy or make a brooder, and has adequate time to care for them, day-old chicks are the cheapest, though because of mortalities they may not always prove the cheapest when the reared cost of each mature pullet is finally worked out. The size of the unit is a great factor, for the hatcheryman rears hundreds of chicks at a time and spreads his

[*Fraser Niederer photos.*

An excellent type of 7-month-old White Leghorn pullet (left) and a 5-month-old crossbred pullet (right) with good head, alert eye, short beak, length of back, and depth of front and abdomen. Pullets of this age are more expensive than younger birds, but good and poor laying types are then easily distinguishable.

[*Fraser Niederer photos.*

Two examples of the "cut-away" type of pullet, underdeveloped for their 4 months of age, which it is a waste of money to feed.

labour costs over them all, whereas the average householder needs only about a dozen pullets and labour per bird is a big item.

Perching Pullets

Therefore there are good arguments in favour of buying perching pullets. Chickens 6 weeks old are not really perching. A few may have learnt to do so, but with a transfer to new quarters they are quite likely to revert to the floor and have to be retaught. Even at 8 weeks old all will not have learnt to perch, but nevertheless that is a desirable time at which to take delivery, for as the pullets grow the price increases.

Older Pullets

If the price is reasonable and can be afforded, least trouble will be experienced with 5- or 6-month-old pullets, but the profit a layer can give is the value of its eggs less cost to maturity, including purchase price and feeding during the laying year, even if its share of the labour costs and housing is disregarded. A high purchase price reduces the net profit. Most farmers do not cater to the demand for nearly mature birds, and if they do, they may be expected to select the best out of each batch for their own flocks, selling only those which fall between the classifications of "commercial" culls and obvious culls. The older the pullets being bought, the more necessary is a knowledge of culling and the points of a good bird.

Whatever the age of the chickens or pullets, the buyer should satisfy himself immediately on their delivery that they have arrived in satisfactory condition. If they have not, the seller should be informed at once.

Early Ordering Advocated

Early in the season is the time for the householder to decide his requirements, and an order should be placed in time to ensure that he obtains what he wants when he wants it. This series of articles has already discussed the best hatching periods for both light and heavy breeds. August and September are favourite hatching months and hatcheries cannot meet all the demands for chicks hatched then. Undue delay in placing an order may find all the better farms booked out.

Flock Improvement Plan

A list of all farms with flocks accredited and blood tested under the conditions of the New Zealand Poultry Flock Improvement Plan is available free on request to the Poultry Instructor, Department of Agriculture, Auckland, Hamilton, Palmerston North, Hastings, Wellington, Christchurch, Oamaru, or Dunedin.

Adding Variety to Fish Meals

By ANNA M. CHAPMAN, Rural Sociologist,
Department of Agriculture, Dunedin

MANY of the less well-known fish not available in the markets today are extremely palatable and nutritious and could help in providing a better-balanced diet if they were used more often. Before the days of the pakeha the Maoris depended to a greater extent than they do today on the sea and the river for a large part of their daily diet.

BECAUSE fish played such an important part in their diet, the Maoris were experts at catching them. They believed they were assisted in this by the advice of their tohungas or priests. Certain days in the month were considered most suitable for fishing and special recitations were prepared for those occasions.

Some fish were more popular than others; hapuku, or groper as it is called in the south, was the favourite, with moki, warehou, mullet, snapper, tarakihi, kahawai, and blue cod following in approximately that order.

Because the Maoris had so many superstitions concerning their fishing and so many rules which could not be broken, they were rather limited in the methods by which they could cook the fish. For what today would be called a picnic meal they would probably grill the fish. The food would be placed skin down on very hot flat stones and would not take long to cook. Fairly thin steaks of fish such as snapper and tarakihi were usually prepared by this method, but smaller pieces were held on sticks and cooked over the coals.

The commonest method of cooking fish used by the Maoris, however, was by baking it in a Maori oven or hangi. They would dig a hole about 2ft. deep in which they would build a large fire of quick-burning wood, placing on top of the fire stones about the size of a man's fist. When the fire had burnt down and the stones were almost red hot the embers and the light ashes were removed from the stones, which were then packed so that they formed a very shallow basin. Fern leaves were usually placed round the edge of the stones. If kumaras or potatoes were being used, they were put in first, the fish being laid on top. Water was poured on and was immediately converted to steam, which was prevented from escaping by covering the food quickly with damp mats and then by heaping earth over the top. The hangi would be left for about an hour, by which time the food would be cooked.

Fish used also to be cooked in a kopaki. This was done by wrapping the fish in a covering of leaves, usually sow-thistle, and placing it in the Maori oven. The leaves gave a flavour to the fish and were often eaten with it.

Another method was to encase the fish completely in a thick layer of mud and bake it in the hot embers of an open fire. The mud case would come off quite easily when the fish was cooked and the baked fish was very tender.

Several varieties of fish in New Zealand are called by one name in one place and have an entirely different name in another. For instance groper is the name commonly applied in the South Island and in the southern part of the North Island to the fish which is known as hapuku in northern parts of the North Island. Piper (North Island) is called garfish in the south, kingfish is known as hake in the south, and herring is called mullet in Otago and Southland.

Recipes for a Variety of Fish

General methods for cooking fish and some standard recipes were given in an article by Eva Topping in the May, 1949, issue of the "Journal". The recipes that follow are less common ones.

Whitebait Fritters

2 eggs
1 teacup of milk
1 tablespoon of butter (melted)
1½ teaspoons of baking powder
1 breakfast cup of flour
Salt and pepper

Separate the whites from the yolks of the eggs. Add the milk and the flour alternately to the well-beaten egg yolks and beat the mixture well. Add the melted butter. Stir the baking powder into the mixture and fold into it the stiffly beaten whites of the eggs.

[*National Publicity Studios photo.*

Sorting a catch on board a deep-sea trawler off the New Zealand coast.

Put the whitebait into a strainer or colander and wash them carefully. Turn them out on to a clean cloth, moving the whitebait along the cloth until they are free from water. Fold the whitebait lightly into the batter.

Put the batter by spoonfuls into hot fat and fry the fritters on both sides until they are golden brown. Drain the fritters on soft paper and serve them decorated with parsley and sliced lemon.

Baked Trevalli

1 trevalli
1 tablespoon of butter
1 teacup of milk
Pepper and salt

Scale the fish and cut off its fins, but do not remove the head. Put the fish, dark side down, into a flat baking dish or meat tin. Season the fish and pour the milk over it. Put the butter in small pieces over the fish and cook it in a fairly hot oven for 10 to 15 minutes. Baste the fish with the milk and the butter two or three times while it is cooking. When the fish leaves the bone it is cooked. Lift it out on to a hot dish and pour the gravy over it. If the fish is large, cut it, before it is cooked, into pieces that are a suitable size for serving. Use a pair of kitchen scissors or a large knife to cut through the bone. Brill, plaice, turbot, butterfish, sole, and flounder can be cooked by this method also.

Paua Roe Patties

2 or 3 paua roes
½ pint of white sauce
12 pastry cases

Carefully remove the roes from the muscle part of the fish. Simmer the roes very gently for about 10 minutes in a little milk and water, strain them, and use the liquid for the white sauce, the recipe for which is given later. Cut the roes into small pieces and add them to the white sauce. Put a teaspoon of the mixture into each pastry case, replace the tops of the cases, and heat the patties thoroughly in the oven.

White Sauce for Paua Roe Patties

½ cup of fish stock or water
½ cup of milk
2 tablespoons of butter
Pepper and salt
2 tablespoons of flour

Melt the butter in a saucepan, add the flour to the butter, and mix them to a smooth paste. Cook the ingredients for a minute or two, add the milk and the stock, and stir the

Toheroas in fried potato shells.

mixture until it is boiling. Add the seasonings and a squeeze of lemon juice.

Pipi Chowder

12 pipis
1 slice of bacon
1 onion
½lb. of potatoes
Milk
Pepper and salt

Scrub the pipis well and put them in a saucepan with a little water. Heat the saucepan for a few minutes until the shells open, when the fish can be removed. The water in which the pipis were heated should be strained carefully to remove any sand and should be kept for the chowder.

Cut the bacon into small dice and cook it in a saucepan until the fat runs. Add the finely chopped onion and cook the mixture slowly with the lid on for about 10 minutes; do not brown the bacon. Dice the potato and add it to the ingredients in the saucepan. Barely cover the ingredients with milk and the strained liquid in which the pipis were cooked. Season the mixture and cover the saucepan. Cook the mixture slowly until the potatoes are soft. Add a little milk or cream and the pipis. Reheat the chowder and serve it. Do not boil it again, because the pipis will become tough.

Paua Fricassee

Remove the paua from the shell and cut away all but the tough, muscular foot. Place this on a board and with a rolling pin beat it well. Cut it through to make two slices. Fry a few slices of bacon and put them in a casserole or other oven dish with a lid. Fry the slices of fish until they are a delicate brown on both sides. Cover them with water in the frying pan and add seasoning and a blade of mace. Bring the mixture to the boil, remove the fish, and place it in the dish with the bacon, pouring the gravy over it. Put the lid on the casserole and bake the contents in a slow oven until the fish is tender (from 4 to 6 hours).

Toheroas in Fried Potato Shells

4 medium potatoes
8 toheroas
1 egg (hard boiled)
1 cup of white sauce (as for paua roe patties)

Peel the potatoes thinly. Cut them in halves lengthways and scoop out some of the centre of each. Wash the cases and dry them well. Cook them in deep fat which should be smoking hot, until they are well browned. Remove the toheroas from the shells, wash them well to remove any sand, and chop them into small pieces. Mix the fish and the white of the egg, chopped up, into the hot white sauce. Fill the potato cases with the mixture. Rub the yolk of the egg through a sieve or strainer and sprinkle it over the top of the mixture.

Any kind of cooked, tinned, or shelled fish may be used for this recipe.

Shellfish Pie

2 or 3 dozen shellfish
2 cups of mashed potatoes
2 cups of mashed carrots
½ cup of milk
A little cheese
Breadcrumbs

Prepare the shellfish by scrubbing them and soaking them in salt water to remove weeds and sand. Remove the fish from the shell and put them into a greased pie-dish. Season the shellfish with salt and pepper and cover them with a layer of well-seasoned, mashed, or cooked sliced potatoes. On top of this place a layer of mashed carrots and sprinkle it with the grated cheese and breadcrumbs. Pour the milk into the pie and bake it in a moderate oven for ½ hour. Shellfish pie is an excellent tea dish for the seaside where cockles, pipis, and toheroas are easily obtained.

Celery and Fish Casserole

½lb. of fish (groper, cod, moki, or tarakihi)
½ head of celery
3 tablespoons of butter
½ cup of water
½ cup of tomato puree
1 teaspoon of salt
¼ teaspoon of pepper
½ cup of breadcrumbs
3 tablespoons of flour

Steam the fish and when it is cooked flake it and remove the bones. Wash the celery, cut it into small pieces, and cook it until it is tender. Make a tomato sauce as follows: Melt the butter in a saucepan and add to it the flour, salt, and pepper. Mix these to a smooth paste and cook them for 1 to 2 minutes. Add about two-thirds of the water to the paste, mix it in well, and return the saucepan to the heat until the mixture begins to thicken. Add to the mixture the rest of the water and about a third of the tomato puree and mix the ingredients until they become a smooth paste. Finally add the rest of the tomato puree and heat the sauce until it boils. Cook it for a few minutes.

Place the flaked fish and the cooked celery in a casserole and pour the tomato sauce over them. Cover the top of the dish with breadcrumbs which have been fried in butter very lightly but not enough to brown them. Bake the casserole in the oven at 350 degrees F. until the contents are brown and heated through (15 to 20 minutes).

Care of Sewing Machines

TO give trouble-free service sewing machines must be well cared for. In the careful maintenance of a machine the following points are important:—

Keep the machine clean and free of fluff from fabrics.

When it is not being used cover the machine to keep dust out.

Keep it well oiled, using pure, light-grade mineral oil. Vegetable oils should never be used to lubricate a sewing machine. (Some oils sold for general household purposes contain vegetable oils.)

It is just as important to oil the moving parts under the head as visible oil holes. Oil the parts under the head by turning back the machine.

Do not spread too much oil on parts which are near the sewing thread.

Run the machine without a needle or thread for a moment after oiling.

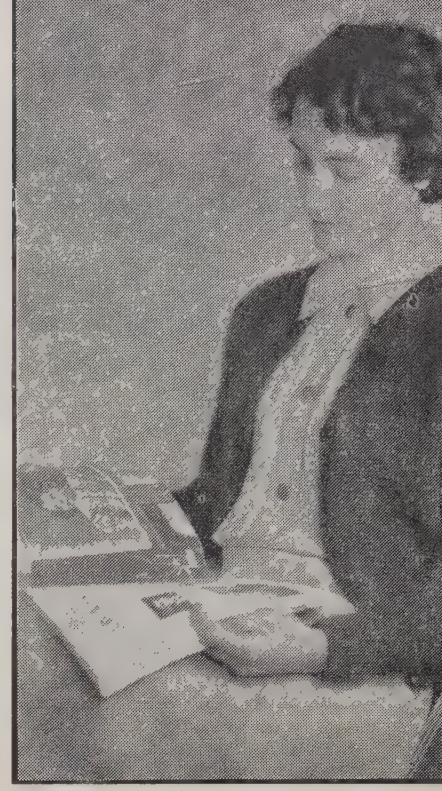
Run a clean duster under the presser-foot (with no needle in the machine) to pick up any oil which would soil fabrics.

Do not apply oil directly to the shuttle, but wipe it with an oily rag.

—EDITH G. McNAB, Rural Sociologist, Department of Agriculture, Timaru

Brushed-wool Jumper-cardigan

KNITTING using double knitting wool and big needles is quick and easy. Though the texture of a garment made in this way is coarse, it can be softened easily by brushing the wool to raise a nap on the surface. This adds to the warmth of the garment too. A pattern for a useful jumper-cardigan, which can be worn buttoned up with a sporting skirt or which serves equally well as a cardigan worn indoors over a dress, and the process involved in brushing wool are described in this article by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington.



MATERIALS required are: 17oz. of double knitting wool, 1 pair of No. 9 and 1 pair of No. 7 knitting needles, 12 buttons, and a wire brush or a natural teasel.

Measurements are: Length from shoulder to lower edge, 20-21in.; bust, 33-35in.; sleeve seam, 18in.

The tension used is 6 stitches to the inch and 7 rows to the inch.

Abbreviations used in the instructions are: k., knit; p., purl.

The Back

Using No. 9 needles, cast on 86 stitches and work a k. 1, p. 1 rib for 3½in. Change to No. 7 needles.

First row: K. 2, p. 1; (k. 8, p. 1) nine times, k. 2. Second row: P. 2, k. 1; (p. 8, k. 1) nine times, p. 2. Repeat these 2 rows three times; then increase at both ends of the next row and every following eighth row until there are 98 stitches on the needles. Care must be taken to keep the rows of ribbing in line while the knitting is continued until the work measures 14in.

Shaping the Armholes

Cast off 4 stitches at the beginning of the next 2 rows, then k. 2 together at the beginning and end of the next 8 rows, when 74 stitches remain on the needle. Continue knitting, keeping the ribbing in line, until the garment measures 7in. from the beginning of the armhole shaping.

Shaping the Shoulders

Cast off 8 stitches at the beginning of the next 6 rows; then cast off the remaining stitches.

Right Front

Using No. 9 needles, cast on 42 stitches and work a k. 1, p. 1 rib for 2 rows.

Third row: Make a buttonhole (k. 1, p. 1, k. 2 together and wind the wool around the needle). K. 1, p. 1 to the end of the row. Next row: K. 1, p. 1 to the end of the row. Continue the ribbing until it measures 3½in., making buttonholes 1in. apart. Change to No. 7 needles, and, starting from the buttonhole edge, proceed as follows:—

First row: K. 1, p. 1 three times, k. 8, p. 1 four times. Second row: K. 1, p. 8 four times, k. 1, p. 1 to the end of the row. Continue knitting these 2 rows, increasing at the underarm edge in every eighth row and making a buttonhole on the inner edge at intervals of 1½in. by knitting the following row: K. 1, p. 1, k. 2 together and wind the wool around the needle. K. 1, p. 1 (k. 8, p. 1) until the end of the row.

Next row: K. 1, p. 8 four times, k. 1, p. 1 three times.

When there are 50 stitches on the needles stop increasing, but continue to knit until the front measures 14in., finishing at the outside edge.

Shaping the Armholes

Cast off 4 stitches at the beginning of the next row and knit two together at the same edge of the next 8 rows until 38 stitches remain. Continue knitting until the front measures 4½in. from the beginning of the armhole; then start the shaping for the neck at the inner edge.

Shaping the Neck

Cast off 8 stitches at the beginning of the next row and k. 2 together at the beginning of the following 6 rows on the same edge. Now 24 stitches remain; continue knitting until the front measures 7in. from the armhole, and finish at the outer edge.

Shaping the Shoulders

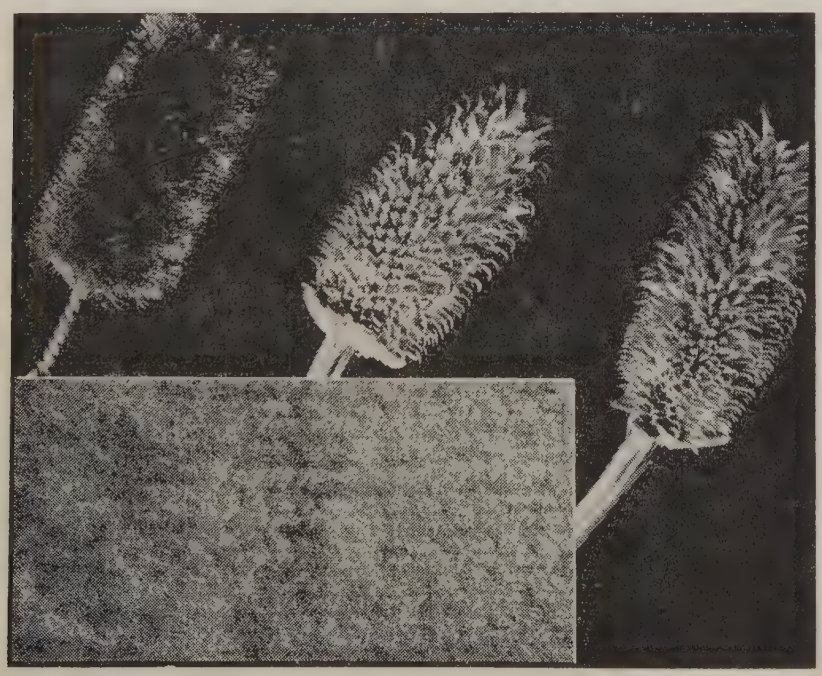
Cast off 8 stitches at the beginning of the next 3 alternate rows.

Left Front

Knit the left front as for the right front, but reverse all the shapings and omit the buttonholes.

Sleeves

Using No. 9 needles, cast on 48 stitches. K. 1, p. 1 rib for 3in. if a



Commercial wire brush (left) and natural teasels (centre and right). Inset—Texture of jumper brushed (left) and unbrushed (right).

Left—Pressing the jumper, using a damp cloth. Right—Teasing the jumper to bring up the surface.

single band is desired, and if a turned-back cuff is wanted, knit rib for 4in. Change to No. 7 needles.

First row: K. 1, p. 1 (k. 8, p. 1) five times, k. 1. Second row: P. 1 (k. 1, p. 8) five times, k. 1, p. 1. Continue knitting these two rows and increasing at both ends of every eighth row until there are 70 stitches on the needles. When the sleeve measures 18in. (or the required length) start the shaping for the top.

Shaping Top of Sleeves

Cast off 2 stitches at the beginning of the next 2 rows and k. 2 together at both ends of the following 4 rows. K. 2 together at both ends of alternate rows until 24 stitches remain; again k. 2 together at both ends of the following 6 rows. Cast off.

The neck-band is knitted after the flat pieces of the jumper have been brushed and the garment has been sewn up.

Brushing Pieces of the Jumper

A nap can be raised on any woollen material if the correct equipment is used, but the process is especially successful when double knitting wool is used. The loosely spun yarn brushes into a soft, fluffy nap that gives the finished garment added warmth. A natural teasel or a fine wire brush and an iron, ironing board, cloth, etc., as for making up any woollen garment, are required. Two of the teasels illustrated are heads of the cultivated variety; the hooked tips on the scales are ideal for brushing wool. The wild teasel which grows in many parts of New Zealand is not suitable, because the scale tip is long and straight. Cultivated teasels are sometimes found in Central Otago, but most are imported. The woollen mills still use natural teasels in the process of brushing materials, as no mechanical device is as efficient.

If a natural teasel is unobtainable, brushing may be done effectively with a fine wire brush, though it is a longer process, requiring more patience.

In either case first press the material, using a damp cloth and a warm iron. When the surface is thoroughly hot and moist brush it with the teasel until a nap is raised. The wool may be brushed in any direction, but it should be given a final brushing so that the nap raised lies in one direction and forms a smooth surface.

Making up the Garment

Join the shoulder seams. Sew up the sleeves, easing any fullness into the top of the armholes. Join the side and sleeve seams.

Neck-band: Using No. 9 needles, pick up 28 stitches from the left front, pick up 24 stitches from the back, and 27 from the right front. First row: K. 1, p. 1 to the end of the row. (As there is an odd number of stitches, the row finishes with k. 1.) Second row: P. 1, k. 1 to the end of the row. Repeat these two rows; then make the last buttonhole. Fifth row: K. 1, p. 1, k. 2 together and wind the wool around the needle. K. 1, p. 1 to the end of the row. Continue ribbing for 5 more rows; then cast off.

Darn back the threads wherever the wool has been joined and sew on the buttons.

The Prevention of Moth Damage

THROUGHOUT the year people who own carpets, upholstered furniture, and woollen clothing must be on guard against the common clothing moth. Though the adult moth is not harmful, the chances of damage are lessened by destroying it, as it lays its eggs in dark, warm, badly ventilated places, and from these eggs the grubs or larvae are hatched. The larvae can be very destructive if not destroyed, as they eat woollen goods of all descriptions. They do not touch cottons, silks, or synthetics.

TO prevent moth damage all woollen goods which are to be stored should be washed or dry-cleaned thoroughly before they are put away. Clothes and blankets are best sprinkled with naphthalene or paradichlorobenzene or with D.D.T. powder and then well wrapped in clean newspapers before storing. If silver fish are also present, D.D.T. powder should be sprinkled in the paper, as they are not harmed by naphthalene. Clothes which are hung in wardrobes should be aired from time to time and should be brushed thoroughly before they are put away. If small calico or muslin bags are made and filled with naphthalene and placed in the pockets or pinned to seams, they will help to prevent damage by moths.

Carpets and upholstered furniture are more difficult to deal with because of their bulk. They should be vacuum cleaned thoroughly and then sprayed with one of the liquid forms of D.D.T., or D.D.T. power, or paper impregnated with D.D.T. may be placed under heavy pieces of furniture or carpets.

Paradichlorobenzene crystals may also be used on upholstery or under carpets. The crystals are best shaken into corners of furniture and put beneath the carpet and again beneath the underfelt.

All the moth preventives mentioned are sold in general stores.

—NELL MACPHERSON,
Rural Sociologist, Department of Agriculture, Auckland

Continuous Colour in the Mixed Flower Border

HERBACEOUS borders are a great asset in the flower garden. They require only a reasonable amount of time for their maintenance and, if the initial planting has been careful, can provide a continuous display of colour for the greater part of the year. However, a common fault of herbaceous borders in New Zealand is that they have considerable non-flowering periods because the initial planning has been done not to provide continuity of flowering, but rather to provide a home in the border for every plant which appeals to the gardener. In this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, lists species suitable for the mixed border according to the times of year during which they bloom rather than according to colour combinations.

Flowering Periods of Herbaceous or Mixed Border Plants

August to October

Alyssum saxatile
Arabis
Aubrietia
Doronicum
Iberis
Polyanthus
Saxifraga cordifolia

October to December

Aquilegia hybrids
Dielytra
Geum
Iris germanica (bearded iris)
Lunaria
Papaver orientale

December to February

Achillea millefolium rubrum
Achillea ptarmica
Aconitum
Anchusa italica
Anemone japonica
Bocconia cordata
Campanula latifolia
Centaurea montana
Centranthus albus
Chrysanthemum maximum
Coreopsis grandiflora
Delphinium
Dianthus (pinks)
Dictamnus caucasicus
Echinops ritro
Erigeron speciosus
Funkia sieboldi
Gaillardia grandiflora
Geranium ibericum
Gypsophila paniculata
Hemerocallis aurantiaca
Inula glandulosa
Linum perenne
Lupinus polyphyllus
Lythrum salicaria
Monarda didyma
Oenothera glauca
Paeonia
Pentstemon barbatus
Phlox decussata
Potentilla
Pyrethrum
Scabiosa caucasica
Statice latifolia
Thalictrum

February to April

Achillea
Aconitum fischeri
Aster amellus
Chrysanthemum
Chrysanthemum uliginosum
Echinacea purpurea
Helenium
Kniphofia
Montbretia
Rudbeckia
Solidago

April to June

Aster cordifolius
Aster ericoides
Aster novae-angliae
Aster novi-belgi
Chrysanthemum
Helianthus
Iris foetidissima
Kniphofia
Nepeta mussini
Rudbeckia
Schizostylis

June to August

Eranthis hyemalis
Helleborus niger
Helleborus orientalis, *H. viridis*, *H. lividus*, and *H. corsicus*
Iris alata, *I. bakeriana*, *I. reticulata*, and *I. unguicularis*
Petasites fragrans
Schizostylis coccinea
Sternbergia lutea
Tritoma

A COMMON belief is that in the colder parts of the country no species suitable for the mixed border can be grown to provide colour during the coldest period of the year. In regions such as Central Otago that is largely true, but in most other parts of the country at least a few species will provide winter blooms. In autumn and spring, of course, many more species flower prolifically, but the great majority of worthwhile herbaceous plants are summer-flowering species. The numbers of blooms in spring can be increased without great difficulty by planting breaks of spring-flowering bulbs, such as narcissus, early-flowering tulips, and a host of other early-flowering bulbs. Autumn flowering likewise can be supplemented by the planting of bulbs which produce flowers during that period. Therefore the only period during which there is a real scarcity of flowers is mid-winter—from June to August. The species listed above are arranged according to their flowering times for the benefit of gardeners who propose setting a section of their garden aside as a herbaceous or mixed border.

The suitability of species for the soil in which they are to be grown also often raises problems. As with all other types of gardening, species to be grown in the mixed border should be selected for their suitability to the soil type with which the gardener has to contend. The lists above enumerate plants which will thrive under normal conditions with a reasonably friable soil, neither very acid nor very alkaline, and of average fertility. Other soil types occurring in New Zealand gardens are the chalks, peaty or acid soils, exceptionally heavy soils, and exceptionally poor or infertile soils. The lists on the left are a guide to the types of plants suitable for such conditions, and because of the natural paucity of herbaceous species a few small types of shrubs and some bulbs are included to make the gardener's task a little easier.

Soil Preferences of Herbaceous or Mixed Border Plants

Plants for Chalk or Limy Soils

Achillea
Bocconia
Dianthus
Helianthemum
Delphinium
Geranium
Saxifraga
Monarda
Papaver orientale
Paeonia
Pyrethrum
Lilium candidum, *L. chalcedonicum*, *L. testaceum*, *L. tigrinum*, and *L. umbellatum*

Shrubs for Acid Soils

Arctostaphylos
Cornus
Erica
Gaultheria
Azalea
Rhododendron

Perennials and Bulbs for Acid Soils

Lilium canadense, *L. giganteum*, and *L. pardalinum*
Primula beesiana, *P. bulleyana*, *P. cockburniana*, *P. japonica*, and *P. pulverulenta*

Perennials for Heavy Soils

Aster
Chrysanthemum
Coreopsis
Helenium
Kniphofia
Lupinus
Rudbeckia
Solidago

Perennials for Infertile Soils

Achillea
Althaea rosea (hollyhock)
Alyssum saxatile
Digitalis
Gaillardia
Geum
Lupinus
Papaver orientale
Dianthus
Statice latifolia

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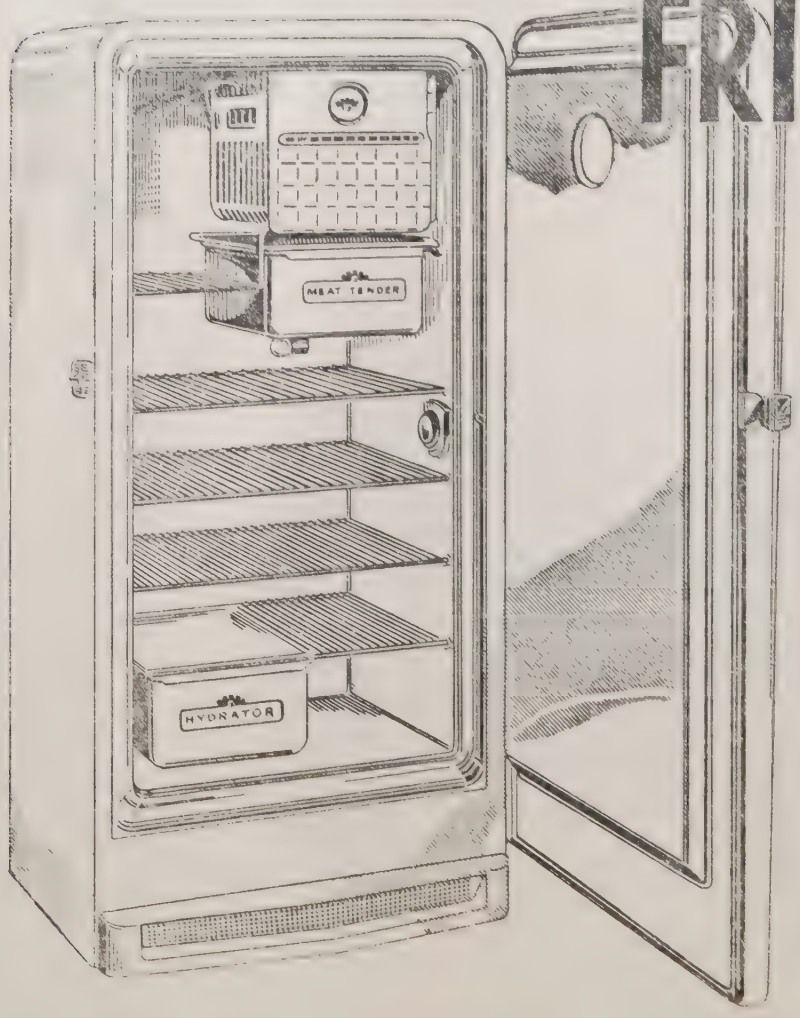

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Bulbs grown in pots or pans for decoration in the house should be watered sparingly until the flower buds appear to ensure that the leaves will not be longer than the flower stalk at the time of blooming. After the bud has appeared above the soil water may be applied more liberally, but the soil must not be allowed to become waterlogged.

Drainage of the soil is a factor well worth consideration at this time of year. Especially in a new garden, a good plan is to dig a few holes here and there and leave them open during the wettest season of the year. If any waterlogging occurs below ground level, it can then be seen and remedial steps planned. Very few plants can tolerate waterlogged soil, even for a short period.

Frosts and thaws are advantageous on heavy clay soils because they break a cloddy condition down to one of fine tilth. Therefore such soils are improved by being left dug in late autumn or winter without further cultivation until the ground is required in spring. However, such a breaking-up effect is a disadvantage to newly planted shrubs, for it tends to loosen the soil about the roots. In such circumstances the soil should be trodden down after each series of frosts.

Gladioli may be planted in July in milder northern districts. It is still too early to plant flowering-sized corms in most other parts of the Dominion, but cormlets may be planted so that they will have the longest possible growing season. They should be sown 1 to 2in. apart and about 1½in. deep.

Greenhouse plants such as gloxinias, streptocarpus, cyclamen, and tuberous begonias can be propagated from seed sown in July. Boxes or trays are filled to within an inch of the top with a finely sieved compost and thoroughly watered through a fine rose. The seed is sown thinly over the surface and, if it is covered with soil at all, a very light and finely sieved layer is sufficient. A sheet of glass should be placed over each box and the whole covered with brown paper to conserve moisture and exclude bright light. The boxes should be inspected frequently, and as soon as the seedlings have appeared the glass and paper must be removed, or the small plants will become "drawn".

[*Douglas Elliott photo.*

Phlox drummondi **is one of the bedding plants of which seed may be sown under glass now. Grown with gladioli, as in the illustration, it makes good ground cover.**

Iceland poppies should be inspected regularly from now on for symptoms of the virus disease known as spotted wilt. Infected plants never recover and are best removed from the soil with a trowel and burnt. To reduce the spread of the disease to a minimum the gardener should wash his hands thoroughly after tending infected plants and before handling healthy ones.

Because of the importance of this disease the following description of the symptoms is quoted in full from "Textbook of Plant Virus Diseases", by K. Smith:—

The first symptom is a clearing of the veins of the youngest leaves. These leaves become somewhat twisted, cease growth with the appearance of symptoms, and gradually turn yellow. The whole centre of the plant acquires a pallid, stunted appearance. In affected field plants, where the rosette of leaves is usually more vigorously developed than in pot plants, a bunched habit is acquired because of the stunting and yellowing of many central leaves. Frequently purplish blotches appear on some of the yellowed leaves or on their midribs or petioles, and a necrosis (dying of the tissue) may set in and destroy the petiole while leaving the leaf blade unaffected. Although diseased plants usually remain alive for weeks in a stunted condition, a rapid extension of the necrosis seen on the petioles sometimes causes the sudden death of the plant. The flowering stems of affected poppies are frequently much twisted and bent over; when they do grow erect they are shorter than normal, more sappy, and brittle, and the buds frequently open badly. The opening of the buds may be delayed until after erection from the recurved position, so that the tip of the bud points vertically upwards, a condition not seen in healthy poppies. The sepals, instead of lifting normally from the receptacle, often confine the petals so long that they burst out laterally. On the flowering stems

[*Green and Hahn Photography Ltd. photo.*

Cyclamen is among the greenhouse plants which can be propagated from seed sown in July. This 2-year-old cyclamen was photographed in full bloom during winter.

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of many affected plants water-soaked areas may appear from which a drop of milky-white latex exudes. This soon becomes brown on contact with the air and dries to a small hard pellet. The exuding of a brownish drop of liquid from necrotic patches on the leaf petioles or mid-ribs in their early stages also occurs at times.

Japanese irises (*Iris laevigata*) are fibrous rooted and may be divided and replanted during July. They need a soil which is moist all year round, but not necessarily waterlogged or boggy, and rich in organic matter.

Lawn aeration is important not only because it improves the physical condition of the soil, but also because it promotes root growth and thus encourages vigour in the turf. Aeration can be obtained by pushing a garden fork in every few inches as far as it will go and drawing it straight out again without any levering.

Roses should be pruned now in all but the coldest districts, where frosts may kill any induced new growth or the ends of pruned branches, thus ruining the shapes of the bushes. For ordinary garden display all young shoots should be cut back to within 9 to 12in. of their bases, and side shoots and all old, dead, or weak shoots should be removed. Where exhibition blooms are required much harder pruning is needed, but this results in fewer blooms and a less shapely bush and cannot be recommended to the home gardener.

Seed of quite a number of plants suitable for bedding displays should be sown this month under glass. Among such plants are antirrhinums, *Verbena venosa*, calendulas, lobelias, East Lothian stock, nemesia, *Torenia fourneri*, and *Phlox drummondi*. The method of sowing is the same as that described for greenhouse plants except that the compost need not be so fine and the seed should be covered more heavily after being sown.

Shrubs which flower on the current season's wood can be pruned in July by cutting back to within a few inches of the older stems all the shoots which grew and flowered during the previous season. Carrying out this treatment annually ensures a constant supply of new flowering shoots and prevents the shrubs from tending to become straggly. A few of the shrubs which should be pruned thus are *Ceanothus* Gloire de Versailles, *Spiraea japonica* var. Anthony Waterer, *Clematis jackmani*, and *Buddleia variabilis*.

[*Douglas Elliott photo*

Spiraea japonica var. Anthony Waterer is one of the shrubs which can be pruned in July as described on this page.

Sweet pea seedlings raised from seed sown last month or earlier, and germinated in a frame or greenhouse, should now be gradually hardened off by being given more air and less protection. They may be planted out in the milder districts—15in. apart if exhibition blooms are wanted and 4 to 6in. apart for mass display.

Other Work for the Month

Thin to 8 to 9in. apart **annuals** sown in the borders in autumn.

Continue planting out **bedding plants** in the milder districts.

Take cuttings of **perpetual flowering carnations** under glass.

Remove dead fronds from **ferns** and spread a layer of compost over the roots.

Plant hardy herbaceous **perennials** such as helenium, rudbeckia, kniphofia (red-hot poker), and gaillardia.

Be careful not to overwater **pot plants** at this time of year. They do not take up much water during winter and readily become waterlogged.

If the soil is wet and cold when **trees and shrubs** arrive from the nurseryman, they should be heeled in until conditions for planting are better.

Aucuba japonica

A VERY hardy evergreen shrub with laurel-like leaves, *Aucuba japonica* bears male and female flowers on separate bushes, and when both are grown near together the female bush produces clusters of bright red berries in winter. It is a valuable addition to the berry-bearing shrubs cultivated for their decorative display in the home and garden. It grows about 6ft. high and is easy to cultivate, thriving in ordinary soil, chalky or otherwise. It is considered one of the best evergreen shrubs for growing in shady places, in tubs, under trees, and in town gardens where the air is often close and smoky. Other varieties bear spotted and distinctive ornamental foliage. The only pruning that may be necessary is a shortening back of excessive growth during November.

Plants may be propagated from cuttings made in autumn from the ends of the shoots and inserted in sandy soil in a cold frame or sheltered border. Ripe seeds may be sown ¼in. deep in a cold frame.

—*H. P. THOMAS, Vegetable Instructor, Department of Agriculture, Wanganui*

Photograph by Broadway Studios.

Baby's Simply Made Knitted Dress

INSTRUCTIONS for knitting a baby's useful, simply made dress in white and a contrasting colour are given in this article. Materials required are: 3oz. of 3-ply white baby wool, 1oz. of 3-ply baby wool in a contrasting colour, two No. 10 and two No. 12 knitting needles, six buttons, a crochet hook, and ribbon for the waist.

THE measurements of the frock are: Length, 16in.; chest, 18in., and sleeve seam, 2in. Tension is 7½ stitches to 1in.

Abbreviations used are: K., knit; p., purl; m. st., moss stitch (1 row k. 1, p. 1; 1 row p. 1, k. 1); sl., slip; wl. fwd., wool forward; tog., together; p.s.s.o., pass slip stitch over; st. st., stocking stitch; dec., decrease; rep., repeat; wl. bk., wool back; patt., pattern; st., stitch(es); beg., beginning.

The Front

Using No. 10 needles and contrasting wool, cast on 132 st. and work in m. st. for ½in. Begin patt. thus:—

First row: Using contrasting wool, k. Second row: As for first row. Third row: Using white wool, * k. 2, sl. 1. Rep. from * to the last 3 st., k. 3. Fourth row: P. 3, * sl. 1, p. 2. Rep. from * to the end. Fifth row: K. Sixth row: P. Seventh row: Using contrasting wool, * k. 1, sl. 1, k. 1. Rep. from * to the end. Eighth row: * K. 1, wl. fwd., sl. 1, wl. bk., k. 1. Rep. from * to the end. These 8 rows form the patt. Rep. patt. rows once more. Break off the contrasting wool.

Next row: Using white wool, k. 9, sl. 1, k. 1, p.s.s.o., * k. 2 tog., k. 18, sl. 1, k. 1, p.s.s.o. Rep. from * to last 11 st., k. 2 tog., k. 9 (120 st.). Next row: P. ** Work 8 rows of st. st., then 8 rows of coloured patt. once. Work 8 rows in st. st. **. Next row: Using white wool, k. 8, sl. 1, k. 1, p.s.s.o., * k. 2 tog., k. 16, sl. 1, k. 1, p.s.s.o. Rep. from * to last 10 st., k. 2 tog., k. 8 (108 st.). Next row: P. Rep. from ** to ** once. Next row: Using white wool, k. 7, sl. 1, k. 1, p.s.s.o., * k. 2 tog., k. 14, sl. 1, k. 1, p.s.s.o. Rep. from * to last 9 st., k. 2 tog., k. 7 (96 st.). Next row: P. Rep. from ** to ** once.

Next row: Using white wool, k. 6, sl. 1, k. 1, p.s.s.o., * k. 2 tog., k. 12, sl. 1, k. 1, p.s.s.o. Rep. from * to last 8 st., k. 2 tog., k. 6 (84 st.). Next row: P. Rep. from ** to ** once. (The work now measures about 11in. from the lower edge.) Next row: K. 1, * k. 2, k. 2 tog. Rep. from * to last 3 st., k. 3 (64 st.).

Change to No. 12 needles. Work in m. st. for 3 rows. Next row: * k. 1, m. 1, k. 2 tog. Rep. from * to the end. Work 3 more rows in m. st. Change to No. 10 needles and work in st. st. for ½in., ending with a row on the wrong side.

Shaping the armholes: Cast off 3 st. at beg. of next 2 rows, then dec. once at each end of every alternate row until 52 st. remain. This completes the armhole shapings. Cont. in st. st. until work measures 15in. from the cast-on edge, ending with a row on the wrong side.

Shaping the neck: Next row: K. 22, cast off 8 st., k. to the end. Work on this second set of 22 st., dec. 1 st. at neck edge on every row until 17 st. remain. Then continue in st. st. until the work measures 16in. from the cast-on edge. Cast off. Rejoin the wool at the neck edge and work to match the other side.

The Back

Work exactly as given for the front until the armhole shapings have been completed. Cont. in st. st. until the work measures 15½in. from the cast-on edge, ending with a row on the wrong side.

Shaping the neck: Next row: K. 19, cast off 14 st., k. to the end. Work on this second set of 19 st., dec. 1 st. at neck edge in the next 2 rows. Continue without further shaping until work measures 16in. from cast-on edge. Cast off. Rejoin wool at the neck edge and work to match the first side.

Sleeves

Using contrasting wool and No. 12 needles cast on 36 st and work in m. st. for ½in. Change to No. 10 needles Next row: K. 3, * k. twice into next st., k. 1. Rep. from * to last 3 st., k. 3 (51 st.). Next row: P. to the end. Now work the 8 rows of coloured patt. as given for the front. Using white wool, work in st. st. until work measures 2in. from the cast-on edge.

Shaping the top: Dec. 1 st. at both ends of every alternate row until 35 st. remain; then cast off 3 st. at beg. of next 6 rows. Cast off the remaining stitches. Work a second sleeve in the same way.

Neck Borders

Front: With the right side of the work facing the knitter and using No. 12 needles and contrasting wool pick up and k. 32 st. evenly along the neck edge of the front. Work in m. st. for 3 rows. Cast off loosely.

Back: With the right side of the work facing the knitter and using No. 12 needles and contrasting wool pick up and k. 24 st. evenly along the neck edge of the back. Work in m. st. for 3 rows. Cast off loosely.

Making the Garment Up

Press the work lightly on the wrong side. Join side seams and shoulder seams for about ½in. at the armhole edges. Join sleeve seams and sew in the sleeves. Work a row of double crochet along shoulder edges, making three small chain buttonholes on each front shoulder. Sew on buttons. Thread ribbon through the holes at the waist.

Working with Velvet and Velveteen

By NORMA K. METSON, Rural Sociologist, Department of Agriculture, Wellington

VELVET is a fabric with a long history, having associations with court life, impressive religious ceremonials, famous paintings, and fashionable ladies. Nowadays the situation is a little confused. Most so-called velvets are really velveteens; the fabric is alternately in and out of fashions; hard-wearing, washable corduroys are puzzlingly associated with delicate silk and chiffon velvets. Most women, too, have memories of childhood "best" frocks of velveteen, which were either loved or loathed, to influence their attitude toward present-day use of this material.

TO eliminate this confusion and to give a background to any discussion of buying and using velvets and velveteens it is necessary to know a little about their construction and manufacture.

History and Construction

First mentioned in English documents at the end of the 13th century, velvets had been woven in Europe before then, and for many years these rich fabrics were an important article of trade between the Continent and England. The best came from Utrecht and Genoa and the material was used for fine clothing, ceremonial garments, hangings, and furnishings.

Real velvet is characterised by a silk pile on a background of silk, cotton, or wool and by the fact that the pile is made by cutting loops left in the warp (lengthwise) threads. In heavier types of furnishing velvets wool or even mohair may be used for the pile, and nowadays the real silk is frequently replaced by rayon. Pattern may be produced by leaving some loops of the pile intact or by special pressing during the finishing processes.

Velveteen belongs to a group of commoner fabrics, the fustians. Backing and pile are both of cotton and the fabric is woven like sateen with floating weft (crosswise) yarns, all over for plain velveteen or in ribs for corduroy. An imitation corduroy is sometimes made by shearing strips down an all-over pile fabric.

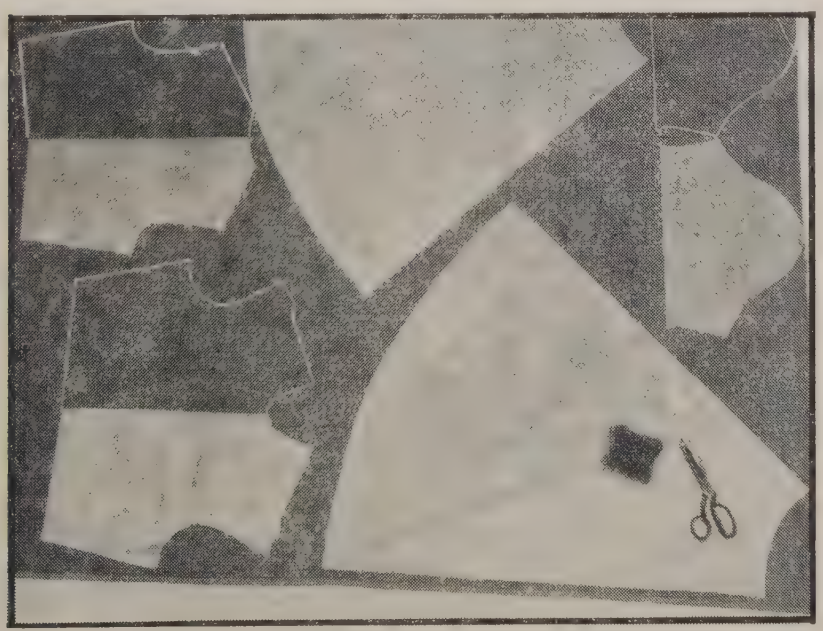
Present-day Fashions

Velvets and velveteens were traditionally dyed in rich dark colours—purple, crimson, and royal blue—and the workaday duns and greys. Present-day fashions have introduced pastel shades—pale pinks, greens, and blues—and the variety of colours and weights now made provides fabrics suitable for any occasion, time of day, or age of wearer. Corduroys and velveteens are particularly popular in the U.S.A.; the pile construction gives weight and warmth to cotton, which is cheap and plentiful there, but lacks warmth when woven plainly.

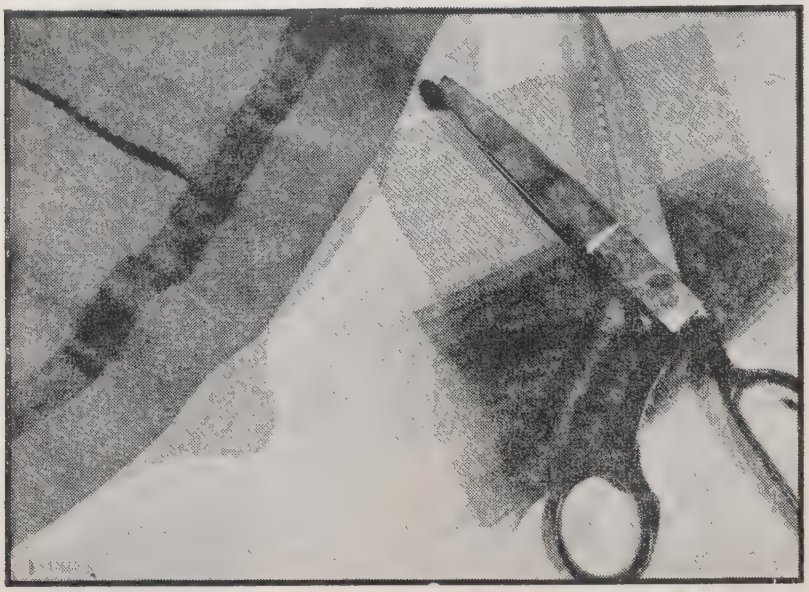
Men's and women's slacks, children's overalls, jackets and skirts, pinafore frocks, and housecoats are garments commonly made of corduroy. Velveteen, though washable and durable, shows signs of wear more easily where the plain pile is rubbed, so is generally kept for frocks which are not worn regularly. Silk velvets are definitely "dress" fabrics. As they drape beautifully and look well under artificial light, they are a natural choice for evening gowns, and no other use is likely to be suggested for the very delicate ribbed or flower-patterned velvets, usually of French origin.

Making up the Material

To the home sewer the most obvious feature of velvets and velveteens is the one-way pile. When the fabric is stroked along the lengthwise grain it feels smooth and soft one way, rough the other. If a length of velveteen is folded in halves, pile side out, and



Pattern laid out on the material before cutting. All the pieces must lie the same way so that the appearance of the grain of the garment is uniform.



Inside of finished garment, showing pinked side seam and hem bound with net.

hung up near the mid point, the halves will have a quite different appearance; on one side the colour appears rich and solid, and on the other light is reflected and there is almost a dusty look.

In the made-up garment the pile should feel smooth when stroked upward. It is essential when cutting out to make sure that all pattern pieces lie the same way and that they face. Pieces may be cut double on a lengthwise fold, but must never be fitted in top to bottom, even though it may appear that in this way tempting savings of material could be effected. If a garment is made up with the pile running both ways, the difference will be very noticeable and the whole appearance will be spoilt.

Good Draping Qualities

Choose styles which make use of the good draping qualities of the material, especially of the lighter silk velvets, and which allow fullness round the skirt and at the elbows. Velvet always shows the first signs of wear where it is subject to abrasion, and any undue strain will make the pile flat and shiny or even cause it to rub off. Decorative stitching used as a trimming or seams finished on the outside should be avoided.

Easy to Work With

Velveteen and corduroy, being firm fabrics which do not pull or stretch, are very easy to work with. Sharp shears are needed for cutting; pinking shears may be used to cut single layers, or later to finish seams, but they will not take a double thickness. When cut-out sections are put pile side together ready for sewing they will stay in place with a minimum of tacking and pinning. Use fine, sharp pins, as blunt ones will damage the pile and make marks which are hard to remove.

Seams, Hems, and Finishes

Sew seams in the direction of the pile; that is, from the bottom up. As the material is bulky, plain seams are the most suitable. For an inside finish they may be pinked, machine sewn or overcast along each raw edge, or bound with net. The last method is especially suitable for the waistline and armhole seams. The hem should be finished with matching net or binding or with neat, close herringboning over the raw edge of the turn-up. For net binding at the hem, cut strips about 2in. wide, double them, and sew them to the right side of the material, raw edges together. Turn the net upward over the raw edges and slip stitch along the folded edge to catch down the hem.

Inner facings or linings can be made of matching sateen or silk to reduce bulk if they do not show on the outer side. Very delicate chiffon velvets may need to be strengthened with net, and silk or chiffon velvets may be piped or bound with matching silks to make an effective edging.

Buttonholes are best avoided when choosing a style, though self-covered or ornamental buttons make desirable trimmings. Certainly do not try to have large numbers of small buttons with buttonholes. Use loop or cord fastenings for buttons, slide fasteners in plackets, and domes at cuffs. If one or two large bound buttonholes are required, they can be reduced in bulk if the final finishing is neat herringboning round the raw edge on the wrong side.

Pressing

Velvets and velveteens should be pressed on a velvet board, which holds the pile on a surface of short spikes, thus preserving it from crushing while the back is steamed and pressed. A thick towel is a possible substitute, though less effective. Alternatively, tip the iron back into a resting position, cover it with a damp cloth, and run the wrong side of the velvet back and forth over it. This achieves steaming and pressing without damaging the pile.

Velvets and velveteens are easy to handle if the few simple precautions are known and observed. The materials make such attractive and useful garments that it is a pity if the home dressmaker excludes them from her list of possible fabrics because she fears that she will encounter problems in making them up, as the difficulties are mostly imaginary.

The Cleaning of Suede

SUEDE is now used so much in gloves, handbags, and shoes that there can be few women who have no suede articles in their wardrobes. These, provided they are properly cared for and regularly cleaned, will give good service.

SUEDE should be brushed with a firm brush after use to remove any dust before the articles are put away. A rubber brush is useful for this purpose. Suede articles should be stored in dust-free cupboards if possible. If they become wet, they should be dried slowly before they are put away.

Methods of cleaning suede vary according to the amount of soiling and also with the age of the suede:—

1. Brushing for light soiling only.
2. Steaming for heavier soiling, watermarks, and slight shininess.
3. Oil of eucalyptus for the removal of greasy marks.
4. Commercial suede cleaners for shininess and very bad soiling and fading.

To remove dust the suede should be brushed, with the grain, with a firm brush or a suede brush. If the brush has wire incorporated with the bristles, it should be used very gently and carefully.

Suede that has become watermarked or slightly shiny should be held in the steam of a fast-boiling kettle. When the article is dry it should be brushed with the grain.

Suede which is very dirty or greasy should be sponged with oil of eucalyptus to remove the grease, and when the eucalyptus has evaporated brushing with the grain of the suede will renew the appearance of the article. This method is particularly suited to the cleaning of suede and kid shoes.

Commercial suede-cleaning solutions are very useful for older articles. They generally contain a pigment and a solvent. The solvent removes the grease and the pigment restores the colour. The instructions given on the container should be carefully followed to ensure a good result.

—NELL MACPHERSON,
Rural Sociologist, Department of Agriculture, Auckland

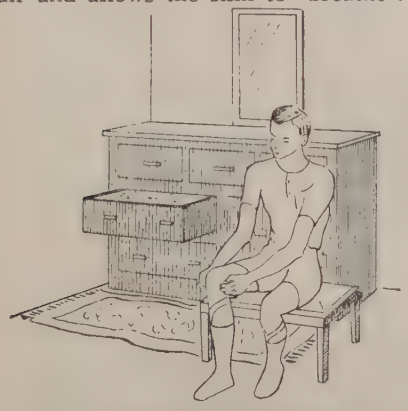
Wool Clothing has Many Virtues

CLOTHING has two main and quite opposite heat functions—to keep in the natural warmth of the body and to keep out cold. Wool, a pure animal fibre, performs these functions better than any other clothing material because it is a natural insulator. In the loose, porous texture of wool fabric countless little pockets of air are entrapped, and this air acts as a constant protection against loss of heat and penetration of cold.

WOOL gives warmth of the healthiest kind—light, airy, and unvarying. Two light-weight pullovers are always better than one of the same total thickness, because the additional layer of air provides extra warmth without extra weight. Wool is warm in itself and does not feel chilly when a garment is first put on; experts say this is because wool tends to improve circulation of blood to the skin.

Comfort and Hygiene

The comfort of wool is the result partly of its softness and partly of its natural elasticity, which enables garments to shape themselves to the figure without restricting body movements. Wool underwear, in particular, because of the springy texture of the fabric, which never lies flat against the skin, permits free circulation of air and allows the skin to "breathe".



Wool removes perspiration moisture from the skin and will absorb up to 30 per cent. of its weight of moisture without becoming damp or clammy. This is a very valuable property, making for both comfort and hygiene. It is particularly appreciated by sportsmen and is one reason why wool is recommended for tropical regions by the Royal Geographical Society.

Protection against Cold and Heat

Most chills are caused by sudden changes of body temperature, usually from hot to cold. In a changeable climate they are an ever-present risk, and wool offers sure protection. It provides constant warmth however much the outside temperature may fluctuate and protects from a too-sudden loss of heat.

Wool also generates heat within itself when it meets cold, damp air, and this is a double protection. Children frequently become hot and sticky rushing about and are then very susceptible to chills. Wool underwear absorbs perspiration without striking damp or chilly, and then evaporation takes place so slowly that the loss of heat is gradual.

In summer, when people wear fewer and lighter clothes, lightly woven wool fabrics ensure an even temperature and proper ventilation. Perspiration is absorbed naturally, and both skin and underclothing are kept comfortably dry. Wool is a slow conductor and, just as this virtue enables it to keep out cold in winter, so it keeps out heat in summer. In many parts of the world wool is worn as protection against the heat of the sun.

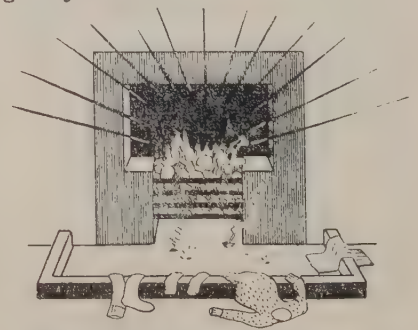
Strength and Elasticity

Wool's capacity for hard wear is immense. A single wool fibre is as strong as a thread of gold of the same thickness, though this is no guarantee that if a small boy catches the seat of his trousers on a nail the result will not be disastrous. Wool puts up a particularly fine resistance to wear at pressure points, such as elbows, knees, and seats because a wool fibre can be bent thousands of times without even weakening. Wherever clothes are required for hard work and exceptionally long wear, such as in the uniforms of servicemen, policemen, and postmen, wool is the standard equipment all the year round.

A single wool fibre can be stretched 30 per cent. of its own length without breaking and when released it will return to normal. Artificial fibres do not possess this natural resilience. When they are stretched they either tear or stay stretched and garments quickly lose their shape and fit. If a wool garment becomes crushed, it need only be hung up to smooth out its own creases.

Resistance to Fire

Some textile fabrics give no protection against fire and, if touched by a spark, will even flare up. Wool scarcely burns at all and, if it does catch fire, tends to smoulder and go out. This is a very important quality, for serious accidents can arise through such simple causes as a spark flying from a grate or curtains being blown by wind into a fire. If curtains, carpets, and upholstery, as well as clothes, are all made of wool, this risk is greatly reduced.



Sheep's wool is usually white, though black, brown, fawn, grey, and even yellow shades of wool are seen. Natural colours are used to good effect in homespuns such as Shetland knitted shawls, but most valuable is the fact that wool, because of its cellular construction, allows dye to penetrate it more deeply than any other fibre, so that some of the loveliest, most enduring colours are found in wool.

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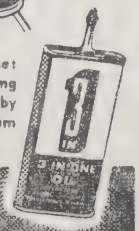

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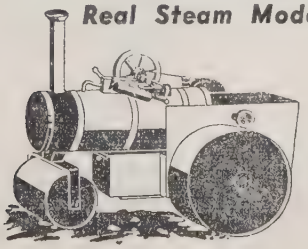

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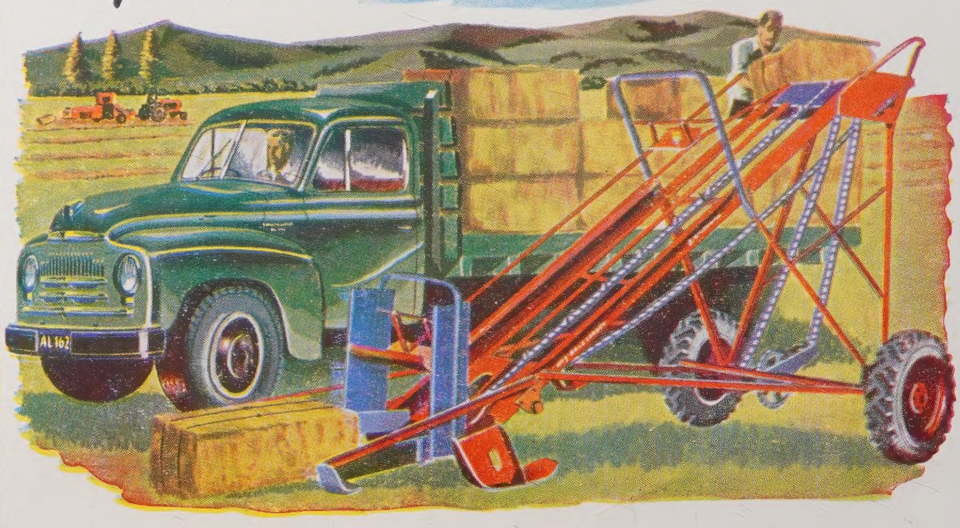

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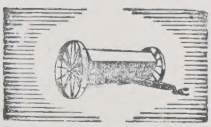

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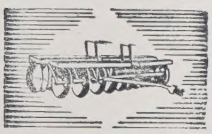

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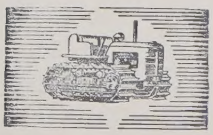

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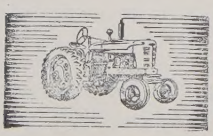

FROM ENGLAND
Hay Balers, Tractors, Green Crop Loaders